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ABSTRACT

This unit provides the student with a simulated experience in the development of decision making skills. The acquisition of petroleum resources in a hypothetical republic provides the basic scenario around which the simulation develops. Students are supplied with specific information about petroleum geology, finances, and drilling. With this knowledge, students are asked to make economic and environmental decisions concerning the future of the republic. Over half of this publication is devoted to maps, charts, and illustrations that can be removed from the unit and duplicated. Background information, as well as activity development of the simulation, is included for the secondary teacher. (MA)

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RESOURCE ACQUISITION

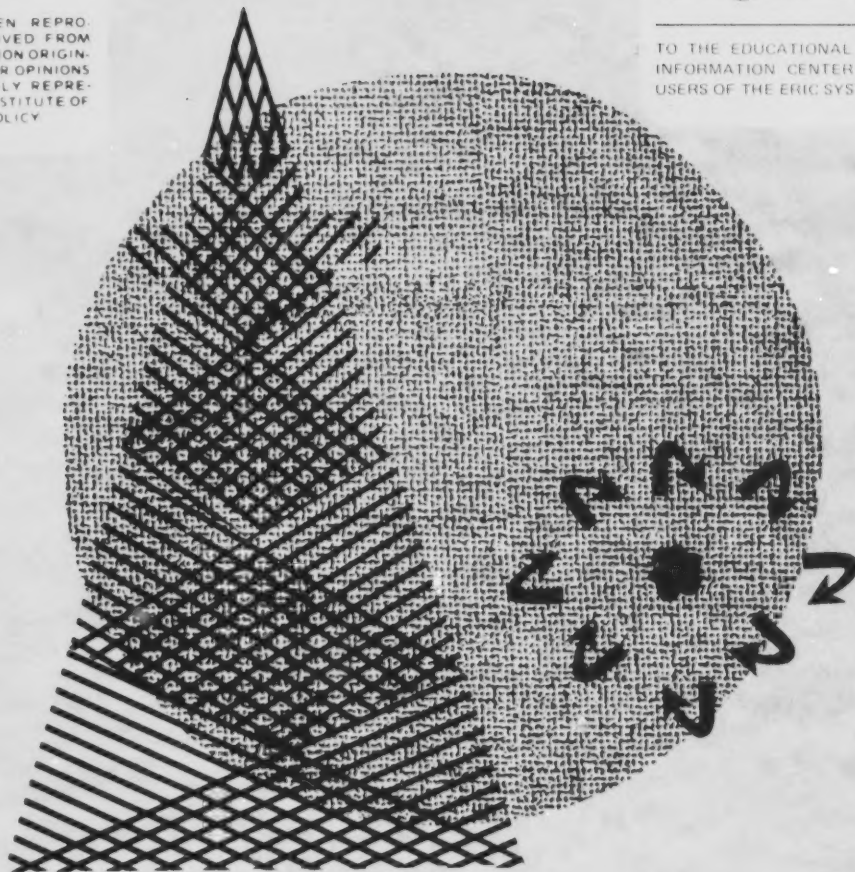
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INVESTIGATING THE ENVIRONMENT

ED165991

SE 025 276

**INVESTIGATING
THE
ENVIRONMENT**

INVESTIGATING RESOURCE ACQUISITION AND USE

By

Jack Sheridan

Illustrated by

David Renner

And

Terry A. Brandt

Third Printing

**HARRIS COUNTY DEPARTMENT OF EDUCATION
Office of County School Superintendent
Carroll Teague - Superintendent**

February, 1977

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Compiled and Edited
by
Terry A. Brandt

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The main body of the Teachers' Notebook was typed on an IBM Selectric II machine using the 12 pitch Letter Gothic element and a pitch setting of 10.

BOOM OR BUST?
SEEKING INSIGHT INTO DECISION MAKING IN THE
ACQUISITION OF PETROLEUM RESOURCES

TEACHERS' NOTEBOOK

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TEACHERS' NOTEBOOK

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BOOM OR BUST?
SEEKING INSIGHT INTO DECISION MAKING IN THE
ACQUISITION OF PETROLEUM RESOURCES

The main purpose of the following structured experience may appear to be that of learning about drilling for oil or gas. Certainly the experience calls for students to learn some specific information about petroleum geology and the financing and drilling for black gold. But the purpose for learning the information is to serve another end: to achieve insight into decision making in resource acquisition and use.* Within this experience the students must become oil operators who then feel the pressures and face decisions that are part of developing a business which must sustain itself and, at the same time, help maintain the national economy of a hypothetical nation. Through the activity of becoming deeply involved in simulated drilling situations, the students should become more cognizant of how role and circumstance play a part in the decision making process; that in reacting to an environmental use decision, one must analyze the players directly involved and the nature of the situation in which they are acting.

The terminal objectives for this structured experience are stated as follows:

1. Each student can identify and explain in writing those factors which were uppermost in mind in making decisions during the activities of selecting and developing oil and gas well sites.
2. On completion of the individual writing, the students can discuss and decide as a group (1) which factors were most important in decision making and (2) how decisions may change in light of altered circumstances. (The altered circumstances will be given by the instructor.)
3. Following completion of the above two objectives, the students, individually or as a team of individuals, can respond in a creative form (panel discussion, simulated TV program, newspaper editorial etc.) to at least one of the following clusters of tasks and questions:

*Petroleum was selected for this experience because the problems associated with its acquisition and use are similar to other resource industries that may be less familiar to the students.

- a. If you considered your operation vital to national interests, express feelings on the matter of governmental aid. That is, should your firm have received money from the government to aid in searching and securing petroleum? Explain your answer.
- b. If you believe money from the government should be given to oil firms, how much should be given and how should the government raise that money? Make a plan and let the class react to it.
- c. If your firm earned a profit, how do you intend to spend the money so that the company will survive and so that the nation always will have plenty of energy (and also will survive). Make a specific plan.
- d. If a national award is to be given to a petroleum company from Alexandria, on what basis should the award be given? As a member of the awards committee, explain the criteria which you believe should be used.

Since many teachers using this strategy may be involved in study of Texas history, some additional activities are suggested at the end of the guide. The activities will involve students in study of the petroleum industry in Texas.

ACTIVITY ONE: WHAT IS MOST IMPORTANT?

Note to the instructor:

This initial activity allows each student opportunity to choose a possible point of view as to what should be considered most when private corporations are engaged in developing petroleum resources. Later the student will compare this beginning view with one which may emerge after he or she engages in a role play experience dealing with locating and drilling for oil and gas. This eventual comparison should help the learner develop insight into decision making in resource acquisition and use.

If a number of students have difficulty in reading, the teacher should read Task Sheet #1 to them. Task #1 may be treated as group discussion rather than an individual assignment.

Objectives:

1. Given a list of considerations, each student can choose the one he or she deems most important in the acquisition of petroleum resources.
2. If called on, the student can orally relate why he or she believes that a particular consideration is most important.

Materials:

Individual copies of Task Sheet #1

TASK	RESPONSE
1. Each student begins the activity by responding to Task Sheet #1. On the sheet, the student indicates which point of view or consideration is most important when drilling for oil or gas. The introduction for the activity can be short and	Each student completes Task Sheet #1. Some may desire further clarification of some of the items("What do you mean by maintaining the national economy?"). Several will want to choose more than one item as the most important consideration.

and simple. One may start by saying, "Oil is in the news lately - a great deal is being said and written about oil companies, the price of gas, etc. What are some of your feelings? On the task sheet place the numeral '1' next to the item you believe should be given most consideration in searching for and securing petroleum. Please try to choose one most important point of view. Even though it may appear difficult to choose, think about them and try to narrow your main choice to one."

2. If time allows, there can be discussion following their response to the task sheet. This will give them opportunity to express individual points of view. The instructor may probe as to why a student selected a particular item as being most important; however, there should not be a press for any kind of closure.

During the discussion the following probably will emerge as the most important considerations:

conserving oil and gas, protecting the environment, providing people with cheap oil and gas, the challenge of finding petroleum.

Since most of the students will not have knowledge or experience regarding the acquisition of petroleum resources, their discussion comments may lack depth of reasoning and/or may be emotionally laden. Positions could appear as the following:

S: "I think conserving oil and gas is the most important thing. If we don't conserve now then we won't be able to live like our parents have."

T: "I'm not sure what you mean, Greg."

S: "Well, I mean that our lives in the future will not be as good. We'll have a lower standard of living because there won't be enough fuel or energy."

S: "I would disagree with Greg. I think we should put most of our efforts toward finding more oil and gas! I think its impossible for us to conserve anymore than we are now. The oil companies should work harder in finding the petroleum we need."

T: "So you're saying the challenge notion should be the most important considerations."

S. "Yeah, invent new ways of finding oil."

TASK SHEET #1

Which one of the following do you believe should be the main concern of companies engaged in drilling for oil and gas:

- the challenge of finding petroleum?
- conserving oil and gas?
- earning a profit?
- helping the national economy?
- protecting the environment?
- providing people with cheap oil and gas?
- other (Please explain.)

Place the numeral "1" next to the item you believe should be the main concern. In the space below, give reasons for your belief.

ACTIVITY TWO: THE MOST IMMEDIATE TASK IS FIND MORE OIL AND GAS!

Note to the instructor:

In this activity the students are introduced to the hypothetical Republic of Alexandria and charged with the task of finding more oil and gas for that country. As Reading #1 indicates, Alexandria is a modern nation facing a possible energy crunch. This same reading relates what problems may occur if no effort is made to develop local petroleum resources. The final paragraph reveals the role students are to assume in searching for and securing this "life blood" of the nation.

Immediately following the reading interest is aroused by handing each student four money notes of one value each. On receiving the notes some will be reminded of "Monopoly", a highly popular game which involves players in risk taking. The instructor can say that risk taking certainly is also a part of the petroleum business.

Even at this early state of the experience, some students may begin to express doubts and lack of knowledge with regard to locating petroleum resources. Hence, the latter part of this activity is given to reading and discussing the information sheets (Material #4) which deal with finding oil and gas. To help them assimilate the information, a seismic survey sheet is given for students to interpret and to indicate possible drill sites. The information sheets will serve as reference materials throughout the drilling activity part of the experience.

Objectives:

Given (1) the task of finding petroleum resources and (2) information sources pertaining to the development of such resources, the class of students can interpret a seismic survey and indicate the best possible drill sites.

Materials:

1. A map of the Republic of Alexandria.
2. An instructor copy of Reading #1, "The Most Immediate Task: Find More Oil and Gas!"
3. Money notes for each student.
4. Individual copies of "Information Sheet #'s 1-11".
5. The transparency illustrating a seismic survey of the Morning Glory Rise oil field.

Procedure:

TASK

1. The instructor begins the session by reading to the students "The Most Immediate Task: Find Oil and Gas!" (Reading #1). The reading will give some direction toward the accomplishment of that task.
2. Immediately following the reading every student should receive four money notes of one value each. While distributing the notes the instructor can say, "As you will soon see, it costs money to drill for oil or gas. The money notes you are now receiving may or may not be enough to get you going in the business. Later you may want to form companies so there can be a pooling of money resources." Handing out the money notes now may enhance interest and excitement in the upcoming drilling activity.
3. Now the students should receive individual copies of Information Sheet #'s 1-10. The sheets present a brief mini-course on locating and drilling petroleum deposits. Depending on the class and instructor, there are several ways of approaching this part of the activity. In some classes the students may read the materials silently. In situations where a number of students have reading problems, the instructor may wish to go over each sheet with them, extending the time length of the activity. It is possible for the students to read and dis-

RESPONSE

The students may be interested in the style of the reading and will anticipate action to follow.

The students will be amused by the money notes. At the same time some will complain that they know nothing about finding petroleum and hence will be apprehensive toward the upcoming drilling activity.

The students should be interested in the information sheets. Care has been taken to make explanations short and simple. Hence, they may move through the material fairly rapidly.

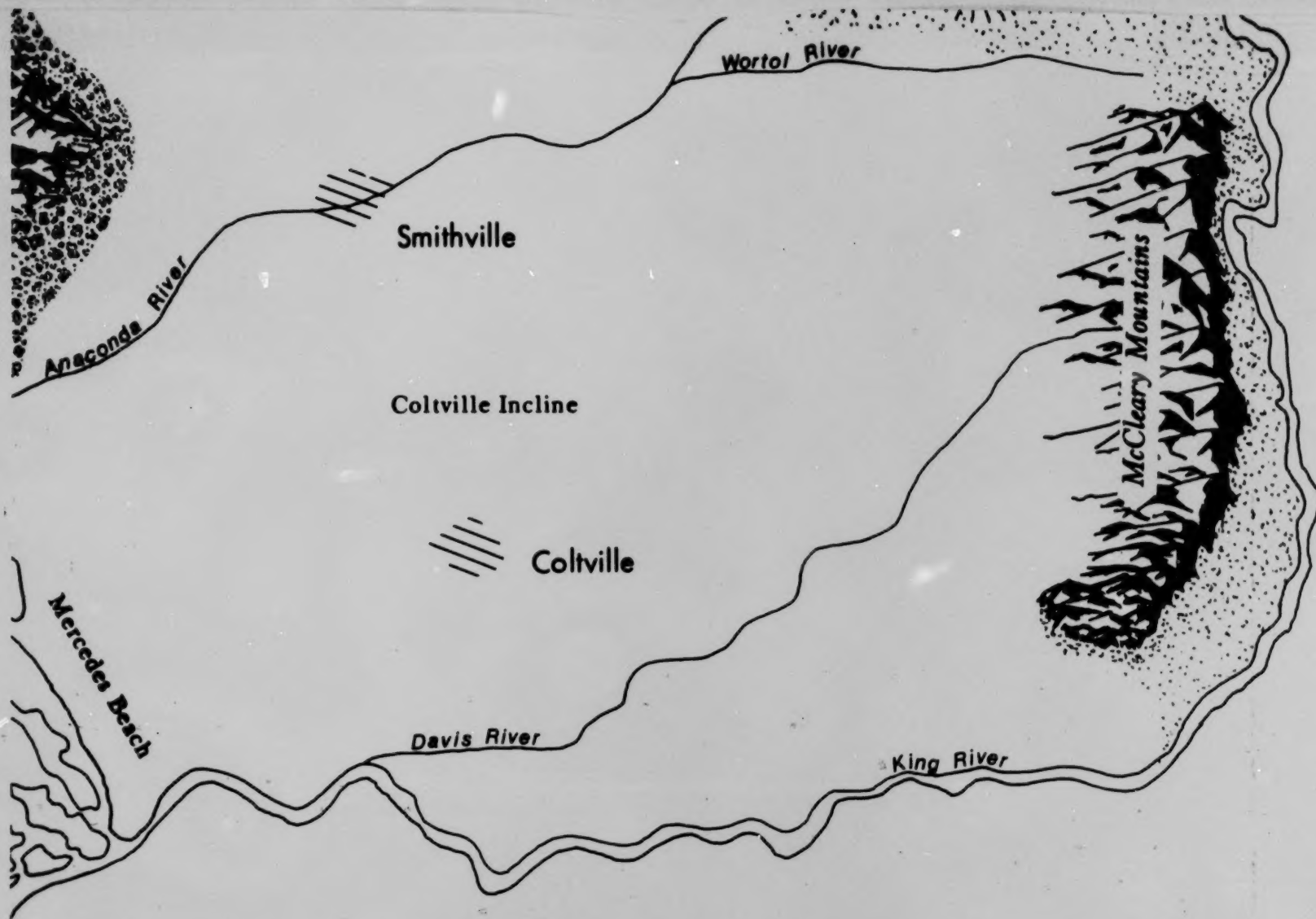
cuss the material in small groups. At any rate, the instructor should feel free to choose a way which best facilitates student involvement with the information sheets.

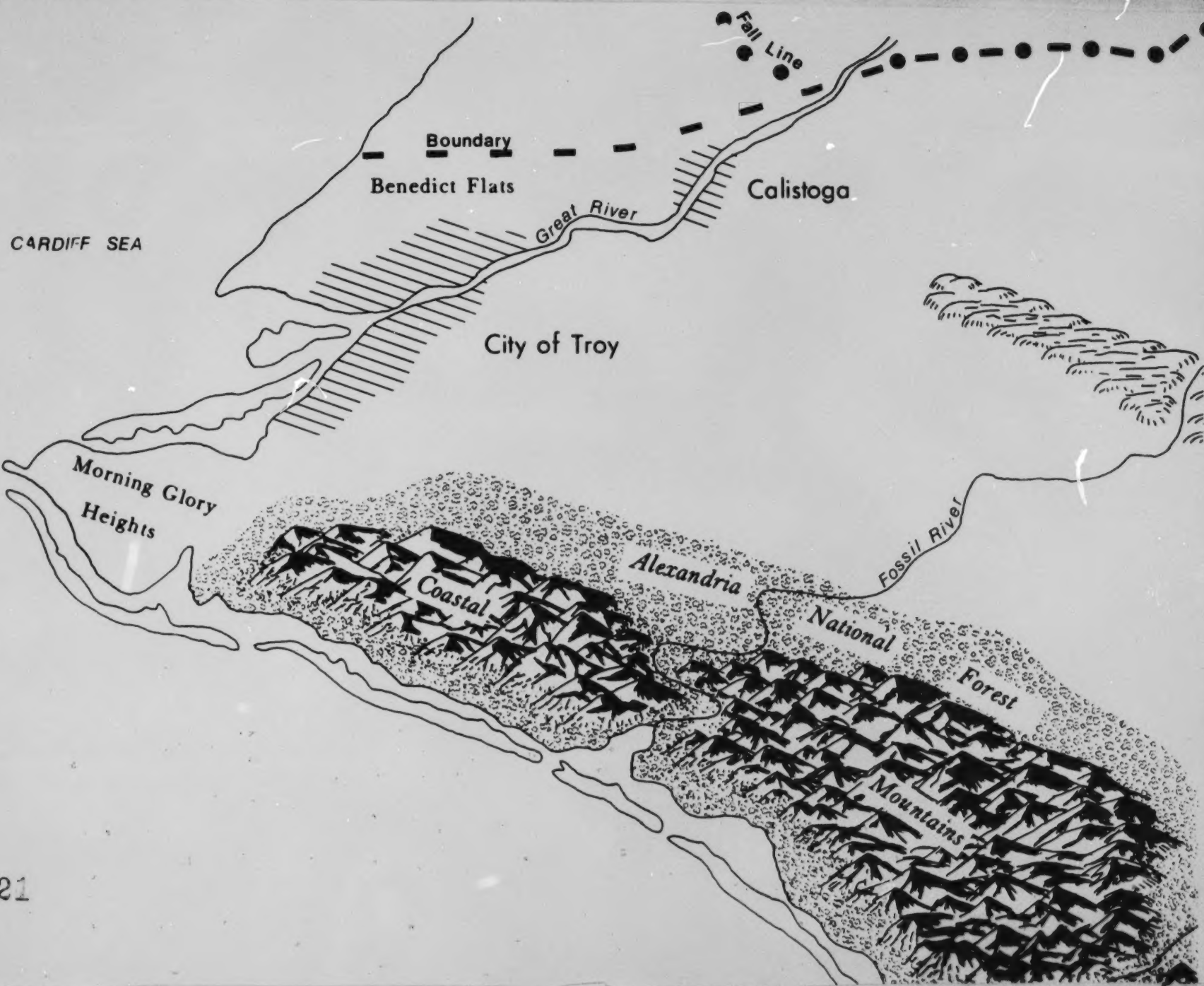
4. Following their reading the instructor can place a transparency of the seismic survey (Material #5) on an overhead projector and ask the class to interpret what they see and where might be the best places to begin drilling. Information Sheet #10 of their packet is the same seismic survey with some general explanation of such surveys.

The transparency and discussion will provide a little challenge and a chance to recap what they have been reading. A likely interpretation of the survey is that it depicts a salt dome or an anticlinal fold. (It could be either; however, in this case it is a salt dome.) For salt domes, drilling usually occurs along the flanks or the top of the dome. In the case of anticlinal folds, drilling generally is concentrated in the top of the structure.

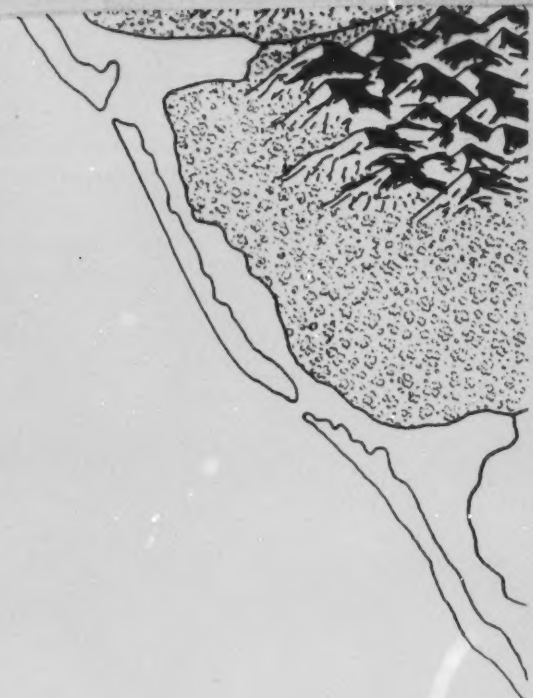
In having students interpret the given transparency, the teacher can emphasize that seismic surveys only show an indication of structure--they do not point to where the oil or gas is. In the end, drilling must be accomplished in order to secure data on the exact nature of the information. So after they have indicated possible drill sites, the instructor can point out that actual drilling will verify their hunches. (In other words, don't tell them where the oil is after they have selected some possible drill sites!)





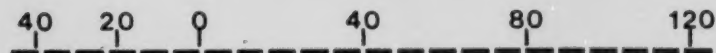


GRANDVILLE SEA



REPUBLIC OF ALEXANDRIA

11a



one inch equals 40 miles

READING #1

"The Most Immediate Task: Find More Oil and Gas!"

The map you see is of an imaginary place called Alexandria. It is a nation with an economy and a standard of living similar to that in the United States. In fact, if you could visit there, Alexandria would remind you of the United States.

During your visit, however, one crisis would become apparent to you. Alexandria is facing an energy shortage. For many years the nation has been able to secure cheap oil and gas from foreign places. It has been easier and less expensive for the people to buy this petroleum abroad than fully develop the petroleum resources at home. As a result development of Alexandria's petroleum resources has lagged. Lately producing nations have been raising prices drastically and now are threatening to withhold shipments.

Alexandrians are fearful of the prospects of being without energy. A newspaper writer in Troy, the largest city in Alexandria, has written the following story to indicate what might happen if there is a long shortage. Note the style she uses to convey her message.

"WHAT IS OUR FUTURE?"

I awoke very early. The house was cold and very dark. The furnace thermometer showed a chilly 60°. I shivered while dressing and did not enjoy my breakfast of cold cereal. My only warmth came from a hot cup of very light coffee. Then I felt some courage to face the day.

Slowly I bundled up and braced myself for a wintry morning. Before stepping out I turned the thermostat to 50°. An icy blast of air slapped me in the face when I finally slipped out the front door. There I stood for a moment and gazed into the darkness.

"How incredible!" I thought. Since my home was perched on the side of a hill overlooking Troy. I was amazed to see only a handful of lights twinkling here and there. The whole city lay before me, cloaked in silent darkness. Not even the streetlights were lit. So I stumbled through the darkness toward the bus stop, five long blocks away.

On my arrival, there was already a crowd of people. "Must get up even earlier!" I reminded myself. One other time the bus arrived so full I couldn't get on. I nearly froze

waiting for the next one. I joined the silent huddle. No one spoke. We just stood numb with cold, wondering if this could be the morning when no bus would arrive. One car crept slowly by. The headlights entranced, hypnotized all of us--everyone appeared as though a passing automobile was an extremely rare sight. (It was.) "Wonder where he got the gas?" I heard someone crack. Then there was silence again.

Slowly, oh so slowly, a bus labored up the long hill. We all watched anxiously, sighing with relief when it finally lurched to a stop in front of us. Somehow we all managed to get on. I had to stand, of course, but then by now I was used to standing. As the bus pulled forward, the motor seemed to miss a few beats and for a moment I had visions of a breakdown. Really, that would not have surprised me at all. Nowadays broken down equipment was a common sight everywhere.

As the bus lumbered toward the central business district, I tried to make out the faces of my fellow passengers. It was difficult, for the bus was dark and everyone was hunched over staring at the grimy floor. They probably all were wondering the same thing as myself; "Will there still be a job for me when I arrive at work?"

That thought became even more real as the bus passed the Mandell Steel Works. I still couldn't believe it was shut down, with thousands more now out of work. The company officials had no choice in the matter. There simply was no fuel to run the place! "How horrible!" I muttered to myself.

We would now face another set of shortages and, of course, higher prices. Because of no steel, canned foods now would be in short supply. More equipment and machinery would remain idle because no metal replacement parts would be available. Farmers already were complaining about the lack of parts and how such a shortage would affect the harvest of next summer's crops. My thoughts focused on the consequences of a massive food shortage.

Shortly the bus jolted to a stop and my thought pattern was shaken. I looked out and was startled by the large crowd gathered around the entrance to the Tower Building where I

worked. I pushed down the packed aisle and lunged off the bus. In panic I almost ran into the silent mass of stunned people. It now was light enough to see faces and it was though they had all received the death sentence.

My boss stepped away from the crowd and greeted me. "It's locked up tight--the heating equipment broke down last night," he announced. "Be another six weeks before they can get parts--if they're lucky," he added sadly. I stood stupefied.

He looked down at me, ran a finger along his tight collar, and pushed up the knot of his tie. Haltingly he said, "Look, I, I've been meaning to tell you something." He stopped short for a moment and then blurted, "We'll mail your check to you!"

We stood staring at each other for what seemed like an hour. Then with a nod he said, "C'mon let me buy you a cup of coffee!" He grabbed my arm and pulled me forward.

I slipped my arm from his grip and answered in a shaky voice, "No coffee, please! There's a shortage! Remember?"

"Yeah, that's right, no coffee," he whispered.

I trudged away. Everyone around me suddenly appeared cold and shabby. "Of course," I reminded myself, "There's a clothing shortage!"

If Alexandria is to avoid the extreme crisis state described above, the task ahead is finding and securing energy resources within the country. Moreover, since most of the nation's industry is geared to the use of oil and gas, seeking petroleum resources must become the most immediate task. Hence, your job as students is to help the citizens of Alexandria locate and drill for specific petroleum deposits!

In the days ahead you are to assume the role of oil operators whose primary task is that of finding the oil and gas so necessary to Alexandria's existence. Your instructor will shortly begin the task of furnishing materials and money so you may begin searching and eventually drill. Good Luck!

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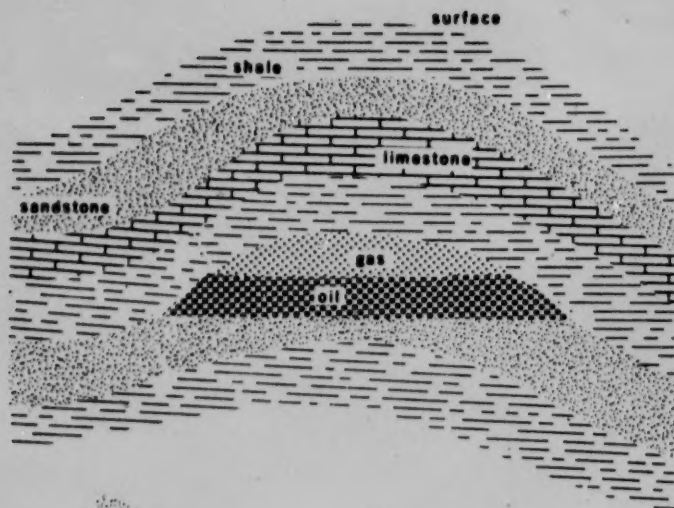
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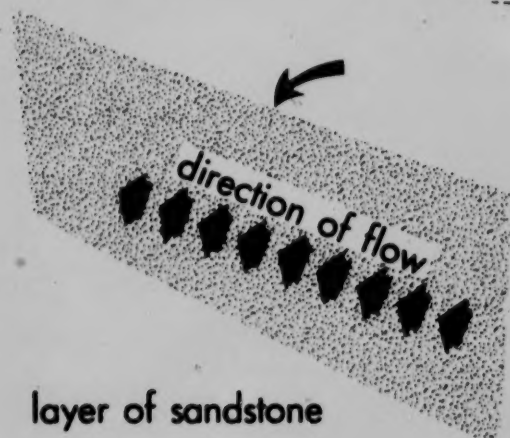
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INFORMATION SHEET #1
FINDING PETROLEUM/GENERAL
not to scale



From where do we get crude oil or natural gas?

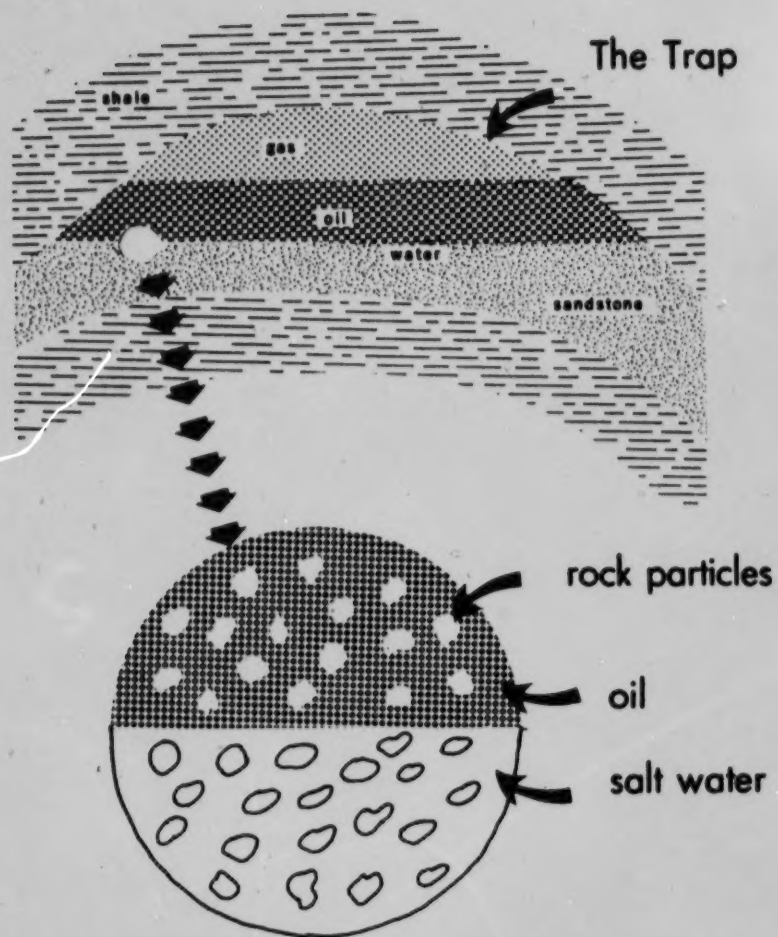
From underground as shown here.



Why has the crude oil and natural gas collected as shown?

Okay, let's take a closer look at the layer of sandstone. Centuries ago particles of gas, oil and salt water started moving upward along the layer of sandstone. The movement or migration may have been caused by pressure. To understand this idea of pressure and migration, consider what happens when you squeeze a wet sponge. (Water oozes out of the sponge parts that are not covered by your fingers).

INFORMATION SHEET #1 (CONTINUED) B



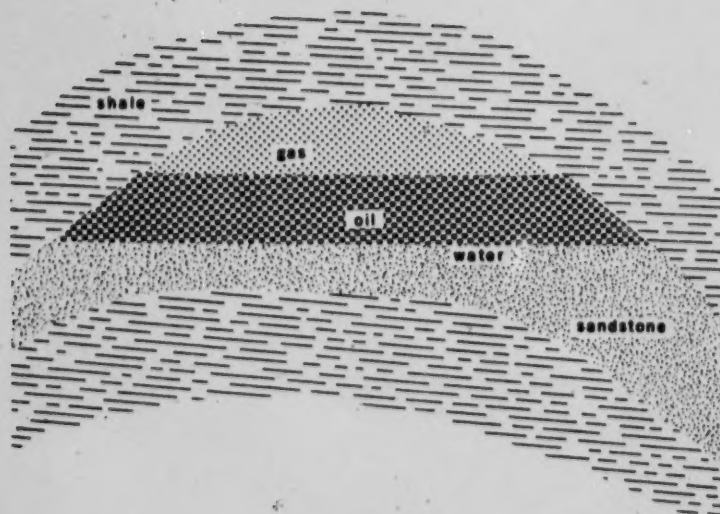
Blow-up of Sandstone

Do the particles ever stop migrating?

The particles will stop migrating when they become trapped. In the case here the particles became trapped in the upper part of a fold in the rock layer. They couldn't move further because the upper and lower beds of rock were non-porous or impervious. In other words, the upper and lower rock layers did not allow the penetration of fluids and gases. So the oil and gas accumulated only in the sandstone layer as shown.

Sand, sandstone, and some limestone layers can be very porous and allow movement or migration. Note how the blow-up of the sandstone shows the porous nature of the rock. Shale, on the other hand, usually is non-porous and acts as a cap rock.

INFORMATION SHEET #1 (CONTINUED) C



Why is the gas on the top, the oil in the middle, and the salt water on the bottom?

Gas is the lightest matter and will migrate to the top part of the trap. Salt water is the heaviest and will be the bottom layer. Have you ever noticed how drops of oil will float in a puddle of water? Hence, oil is over the water.

Where do geologists begin looking for oil or gas?

Deposits of oil or gas usually are associated with sedimentary rock layers such as shale, sandstone, or limestone.

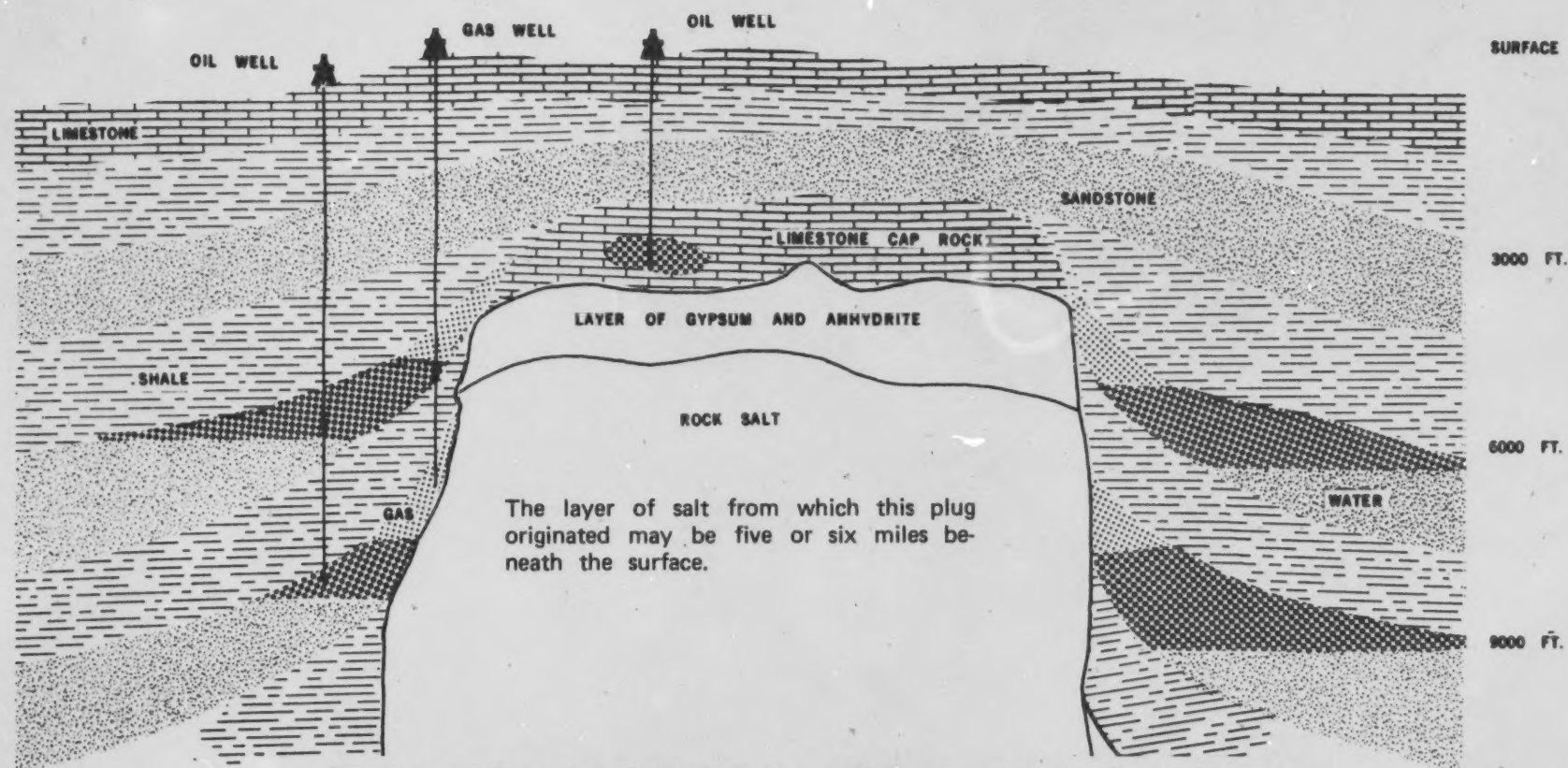
One probably will not find petroleum in areas where there are only igneous rocks such as basalt or granite. This also is true in places where there are only metamorphic rocks such as marble or slate.

To further answer the last question, look at the following information sheets.

INFORMATION SHEET #2

FINDING PETROLEUM/SALT DOME

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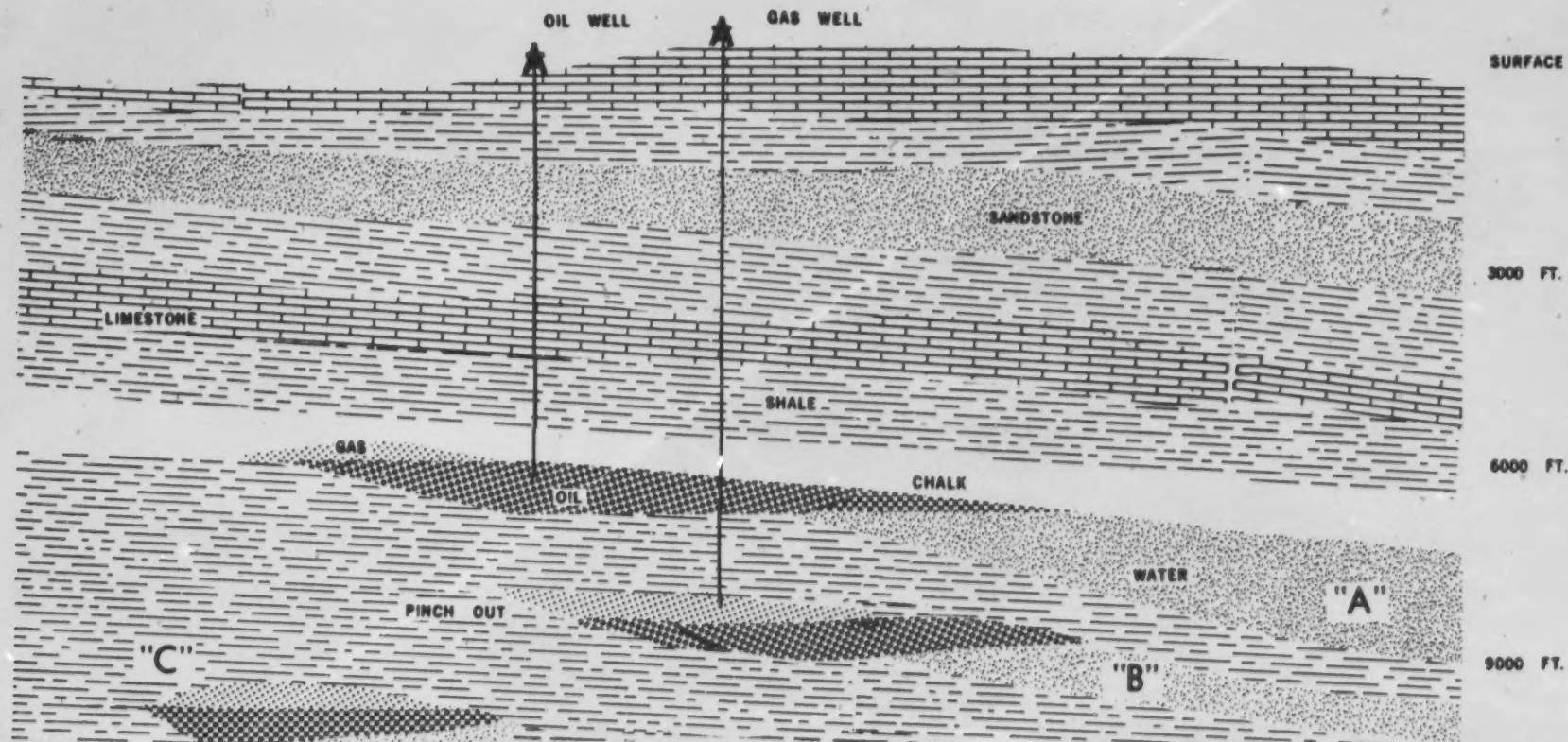


Salt domes are huge plugs of salt which have pushed up through layers of rock. As is illustrated, the rock layers are bent up against the plug, creating traps for crude oil and natural gas. Sometimes oil also collects in cavities in the limestone cap rock over the salt plug. In 1901 there was a tremendous salt dome oil discovery at Spindletop, near Beaumont, Texas. Many salt domes have been discovered in Texas, Louisiana, and Mississippi.

INFORMATION SHEET #3

FINDING PETROLEUM/STRATIGRAPHIC TRAPS (LENS TRAPS)

not to scale



This sheet illustrates several kinds of stratigraphic traps. The top most petroleum bearing sand deposit ("A") becomes thinner from right to left and is finally pinched out at a point where shale and chalk come together. The oil and gas is trapped in the upper portion of the sand formation between the two nonporous layers of shale and chalk. This example is not too different from the great East Texas Oil Field.

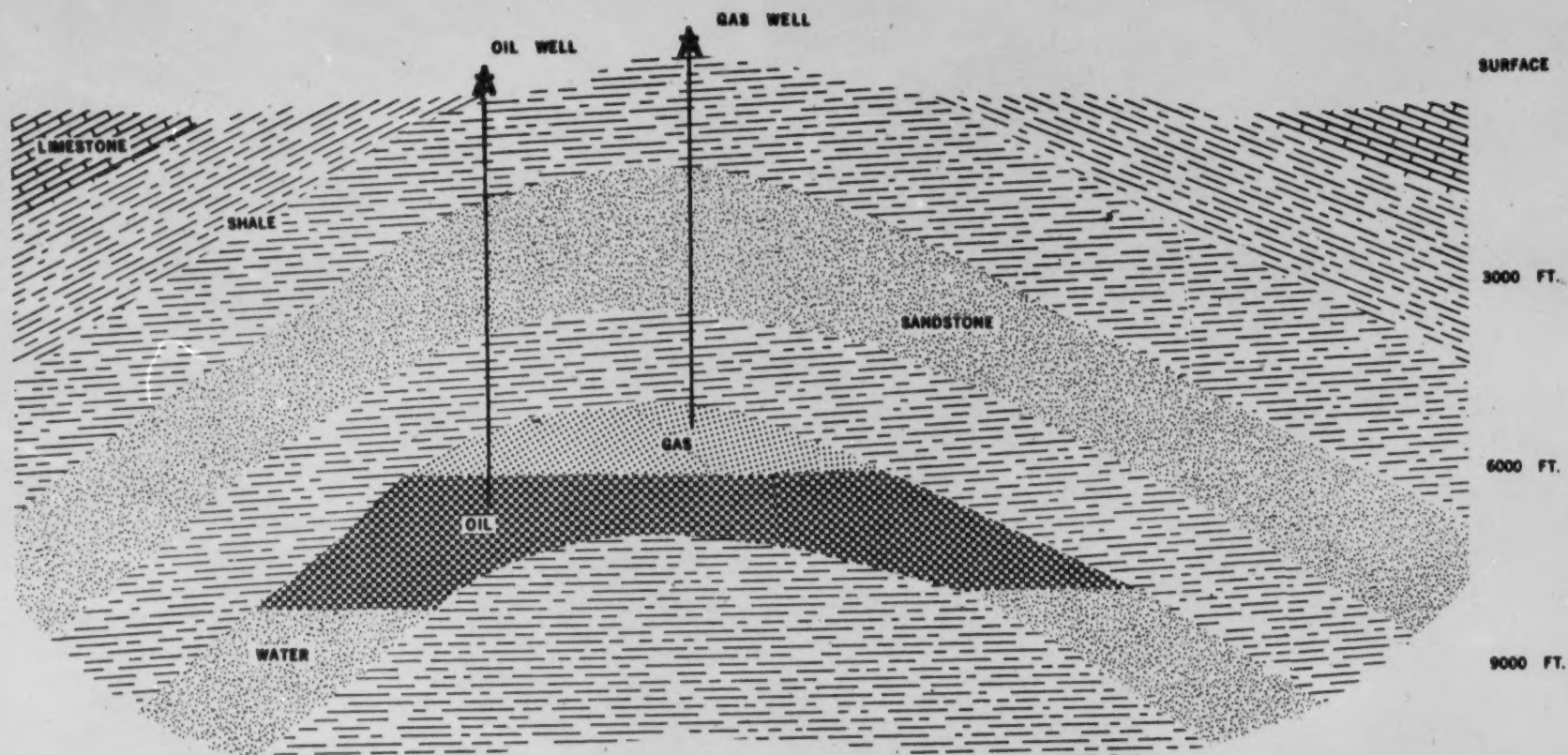
The "B" sand formation grades into or is pinched out in a layer of shale. Two zones of pinch outs occur in rock strata of the Texas Gulf Coast. Note how wells have been drilled so petroleum can be secured from both formations. ("A" and "B")

"C" is a petroleum bearing sand body completely surrounded by a layer of impervious shale. Like many stratigraphic traps, it may be difficult to find, for even the most sensitive seismic instruments may not reveal such traps.

INFORMATION SHEET #4

FINDING PETROLEUM/ANTICLINAL FOLD

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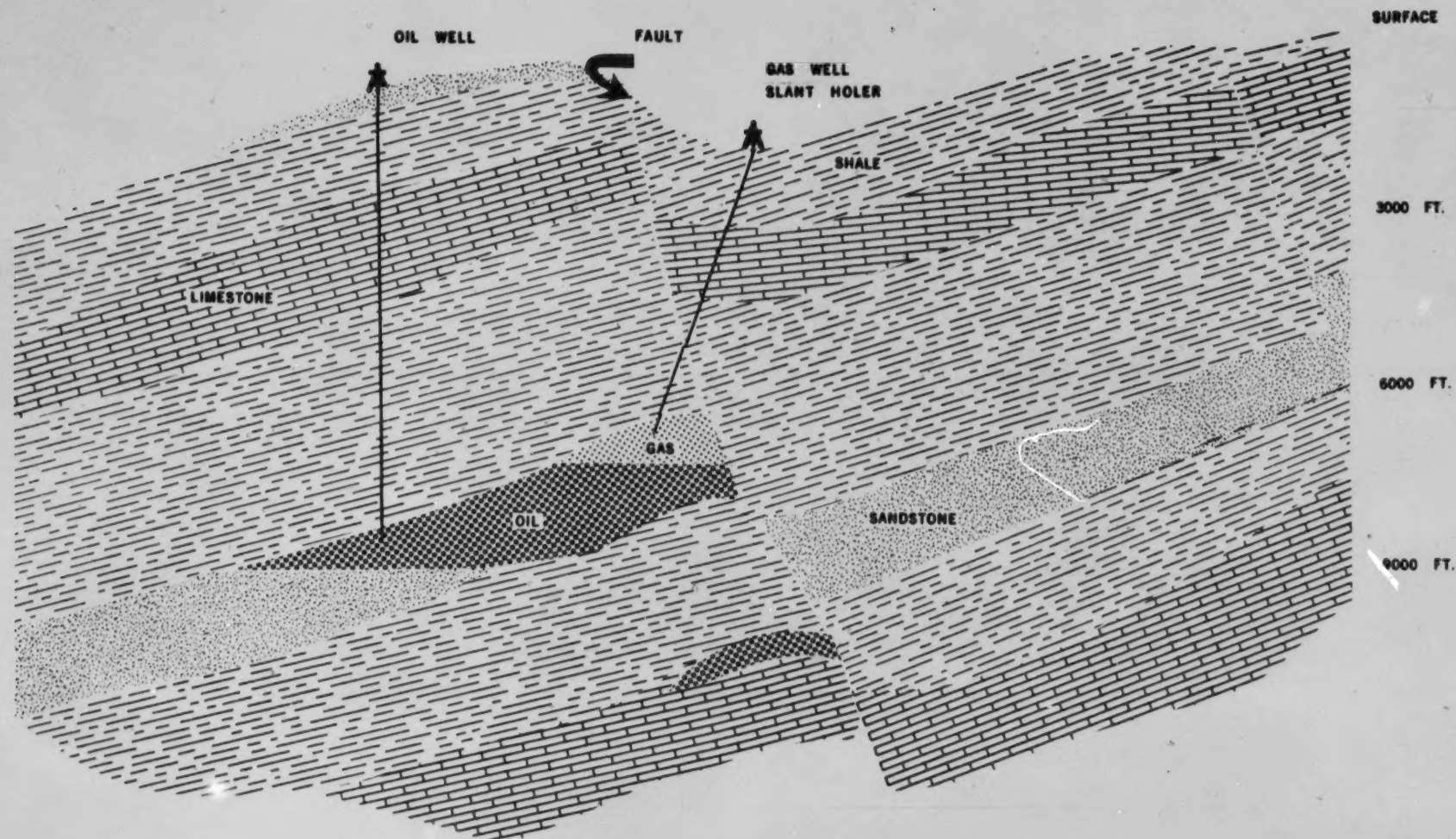


The anticlinal fold is a dome structure in which layers of rock have been arched upward as shown. Gas, oil, and salt water have migrated up the porous layers of sandstone and been trapped by the non-porous layers of shale. Many such structures have been discovered in the Rocky Mountains.

INFORMATION SHEET #5

FINDING PETROLEUM/FAULT TRAP

not to scale

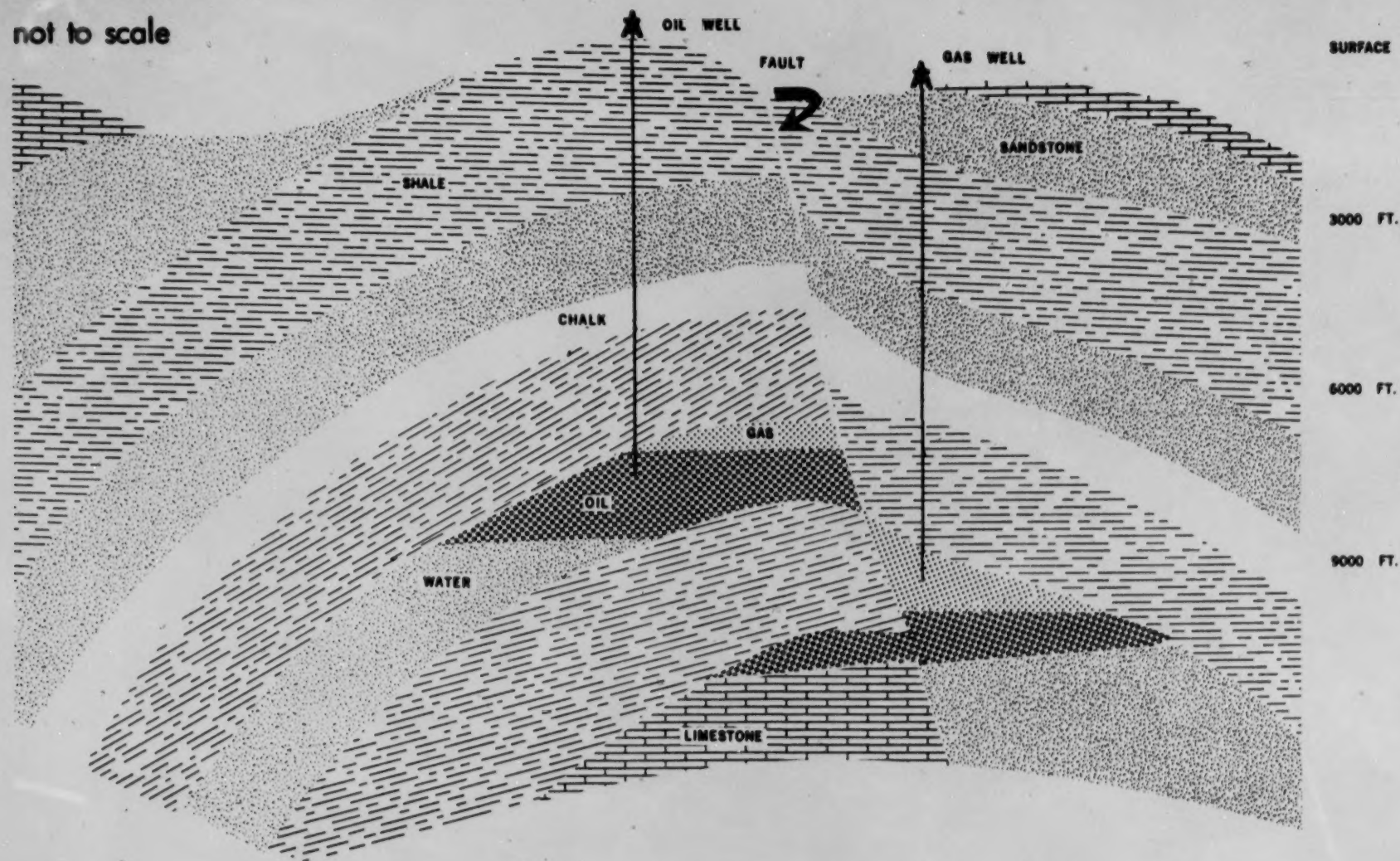


In this illustration oil and gas have migrated up the sandstone formation and been trapped by a huge layer of shale moving slowly downward. A porous layer of limestone also has been affected. Note how the fracture (fault) has caused the displacement of sedimentary rock layers.

INFORMATION SHEET #6

FINDING PETROLEUM/FAULTED ANTICLINE

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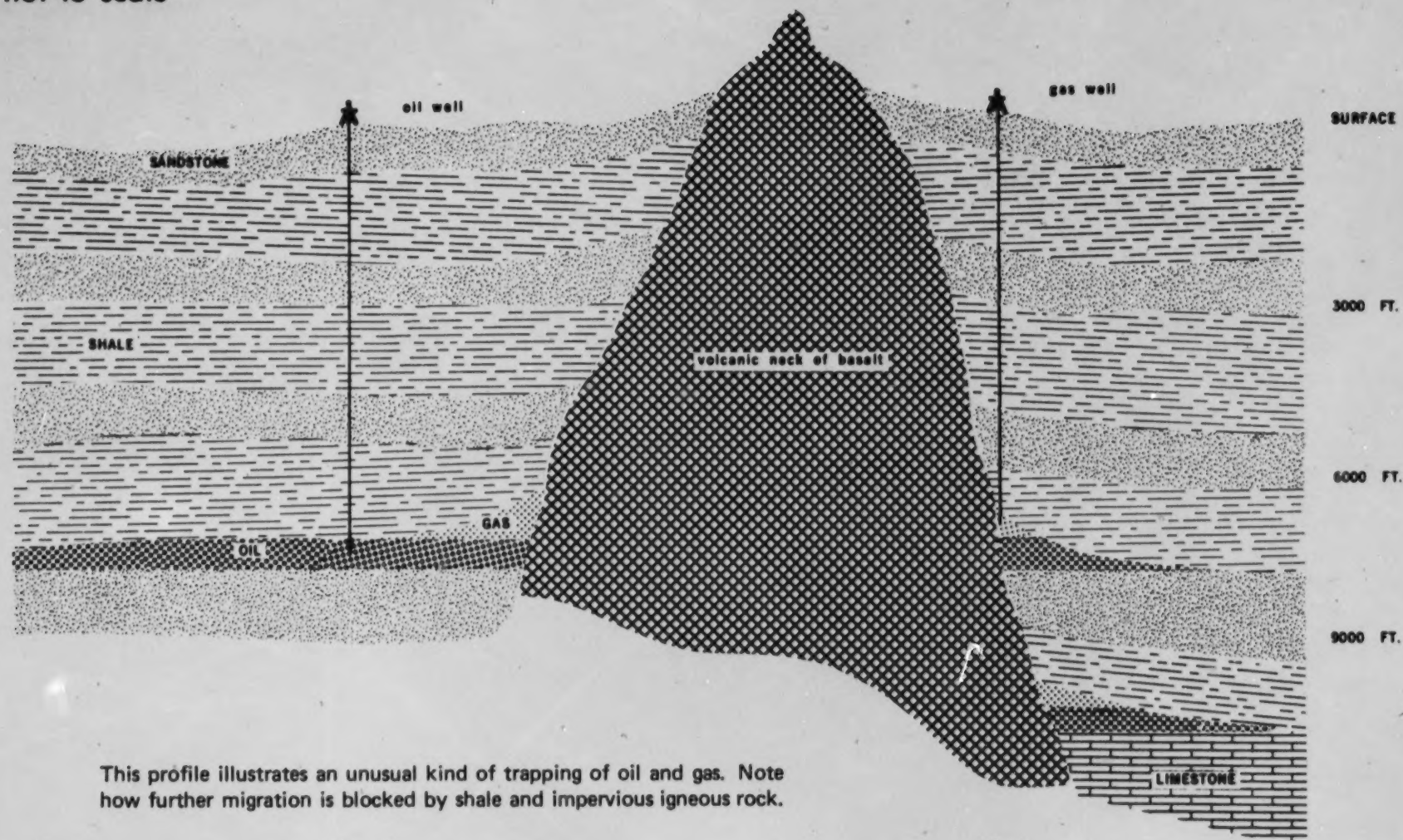


This sheet illustrates a variation of Sheet No.'s 4 and 5. An anticlinal fold has fractured or faulted and petroleum has accumulated as might be expected.

INFORMATION SHEET #7

FINDING PETROLEUM/IGNEOUS PLUG

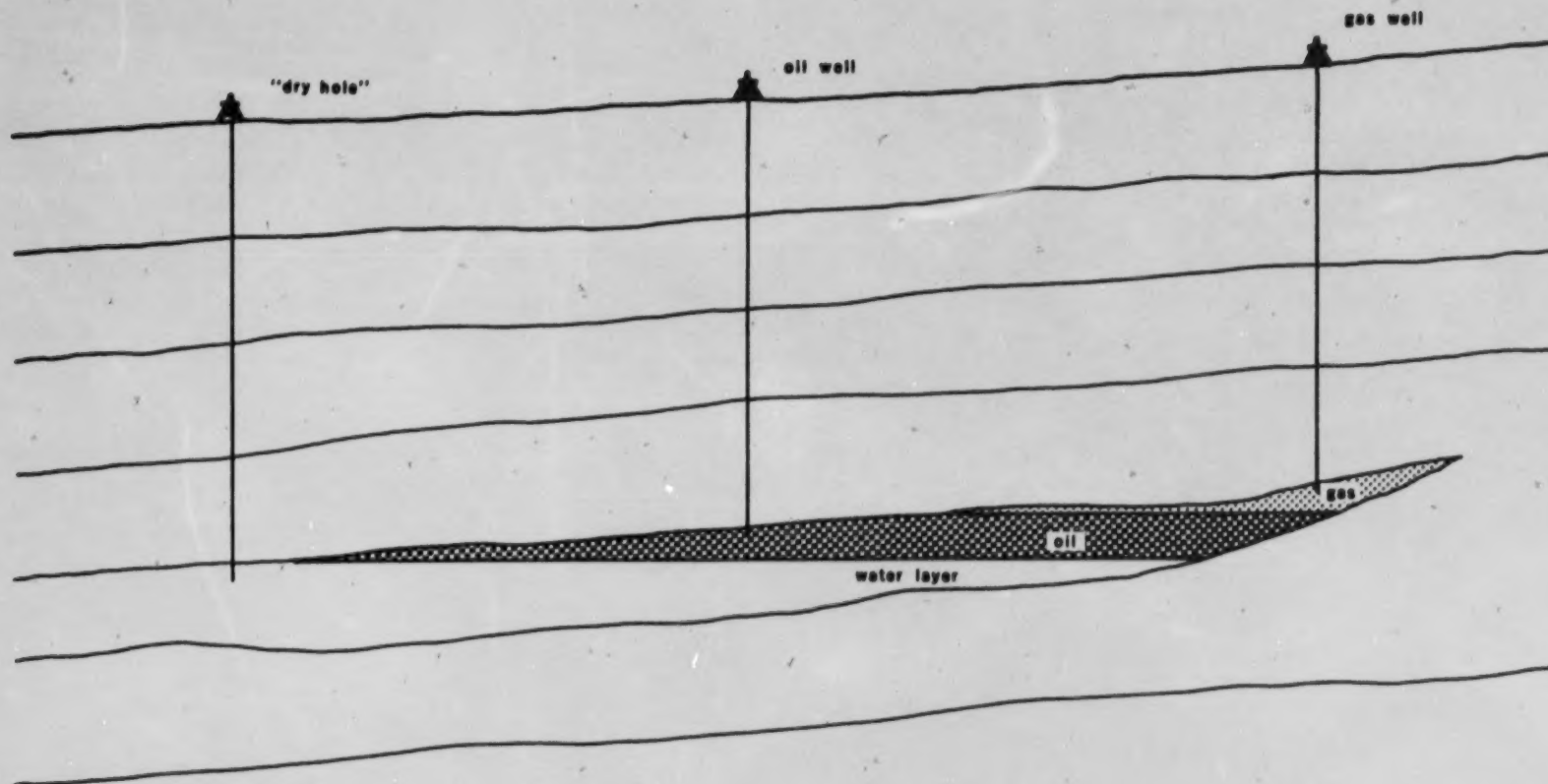
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This profile illustrates an unusual kind of trapping of oil and gas. Note how further migration is blocked by shale and impervious igneous rock.

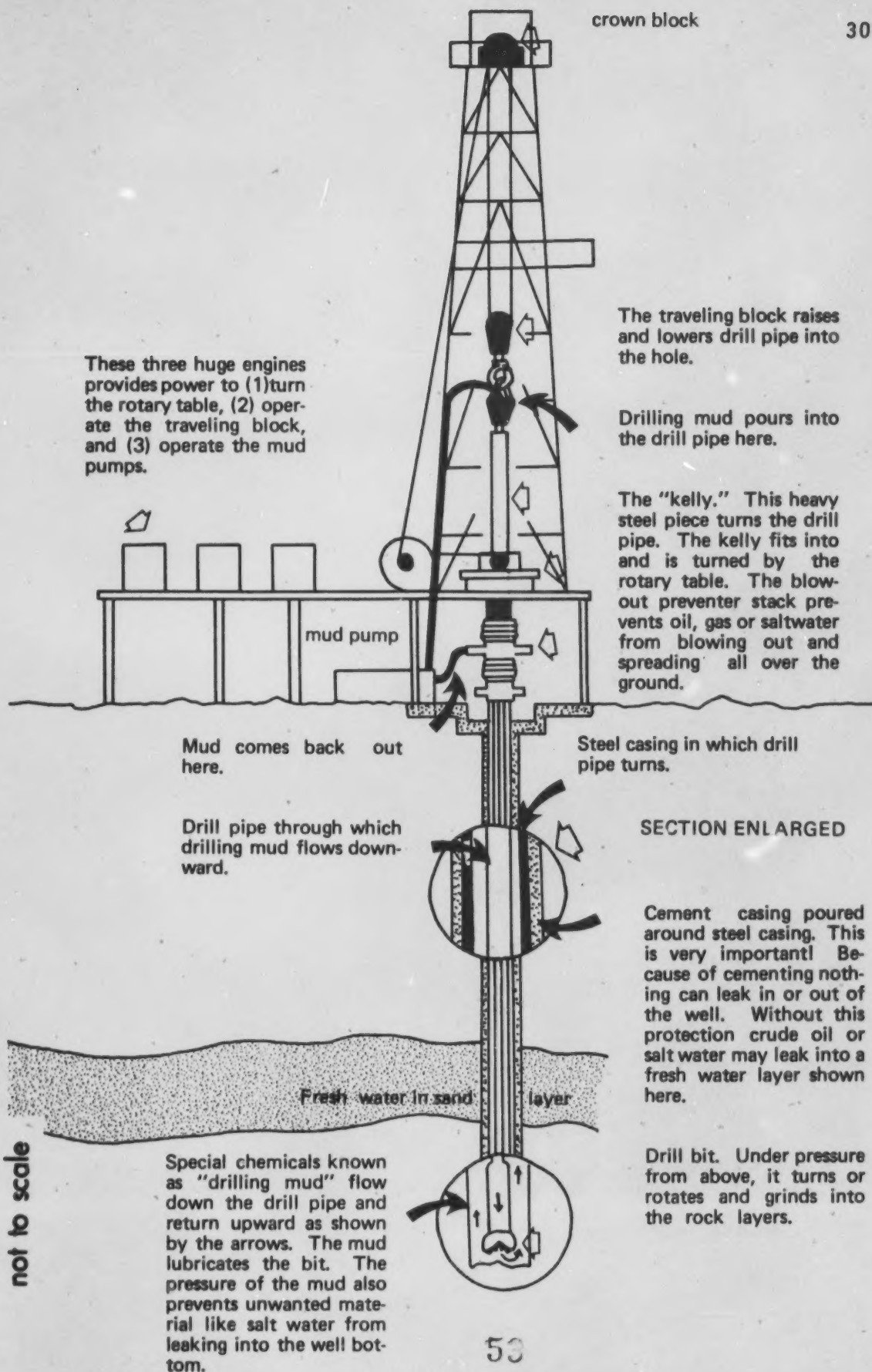
INFORMATION SHEET #8

FINDING PETROLEUM/WELL TYPES



Here are three wells that have been drilled. The gas and oil wells will be money makers. Unfortunately one well missed the petroleum deposits and struck salt water. A well that does not produce gas or oil is called a "dry hole" or "duster". Of all Texas wells drilled in 1973, about 35 per cent were "dry".

not to scale



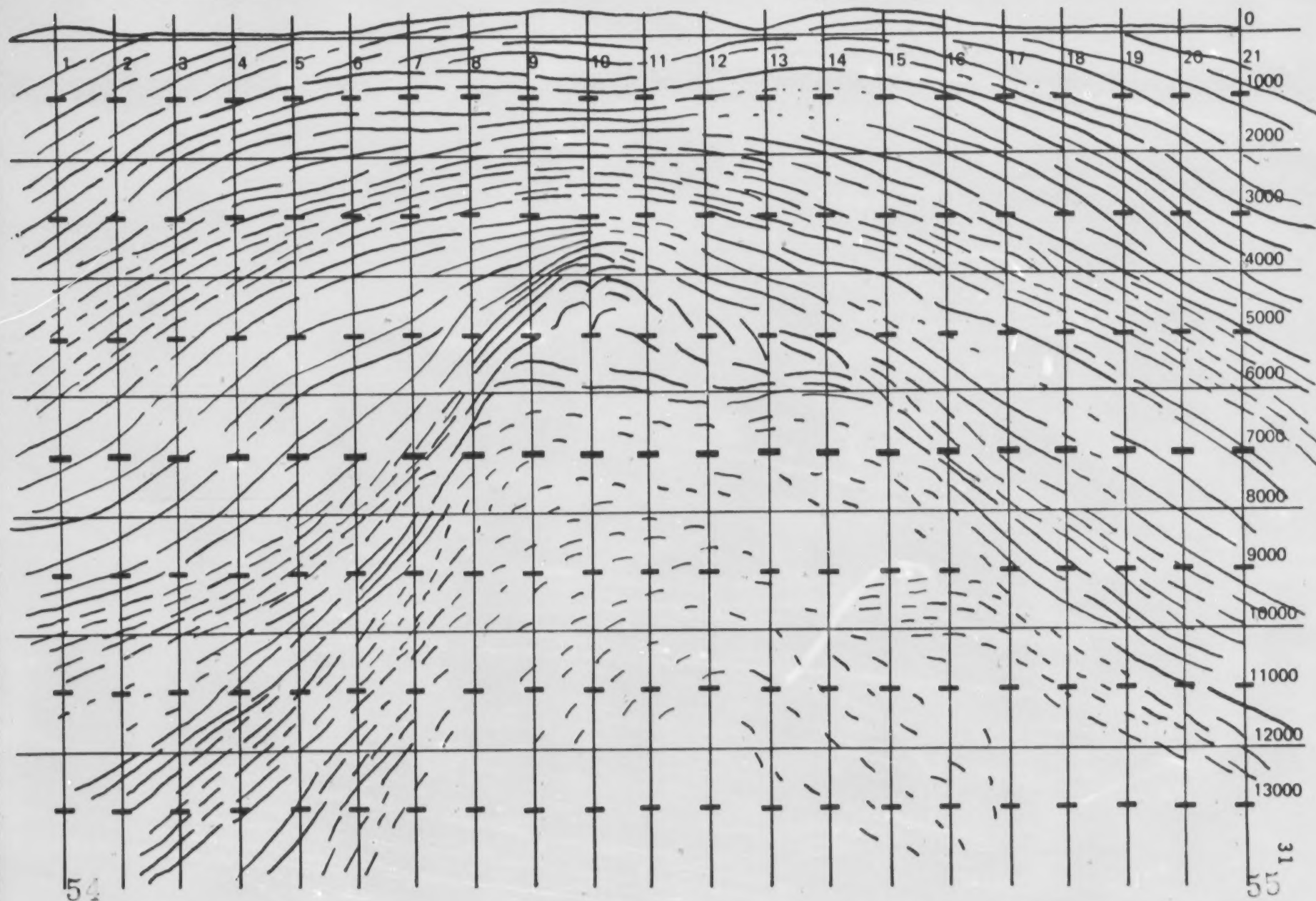
INFORMATION SHEET #10

A SEISMIC SURVEY

MORNING GLORY RISE SEISMIC SURVEY

Top layer: limestone

September, 1961



To help oil companies locate petroleum deposits, geologists can set off small explosions which send sound waves deep into the earth. These waves strike the rock layers and are reflected back to the surface. From the signals sent back, maps of subsurface structure can be made. This information sheet shows one such map.

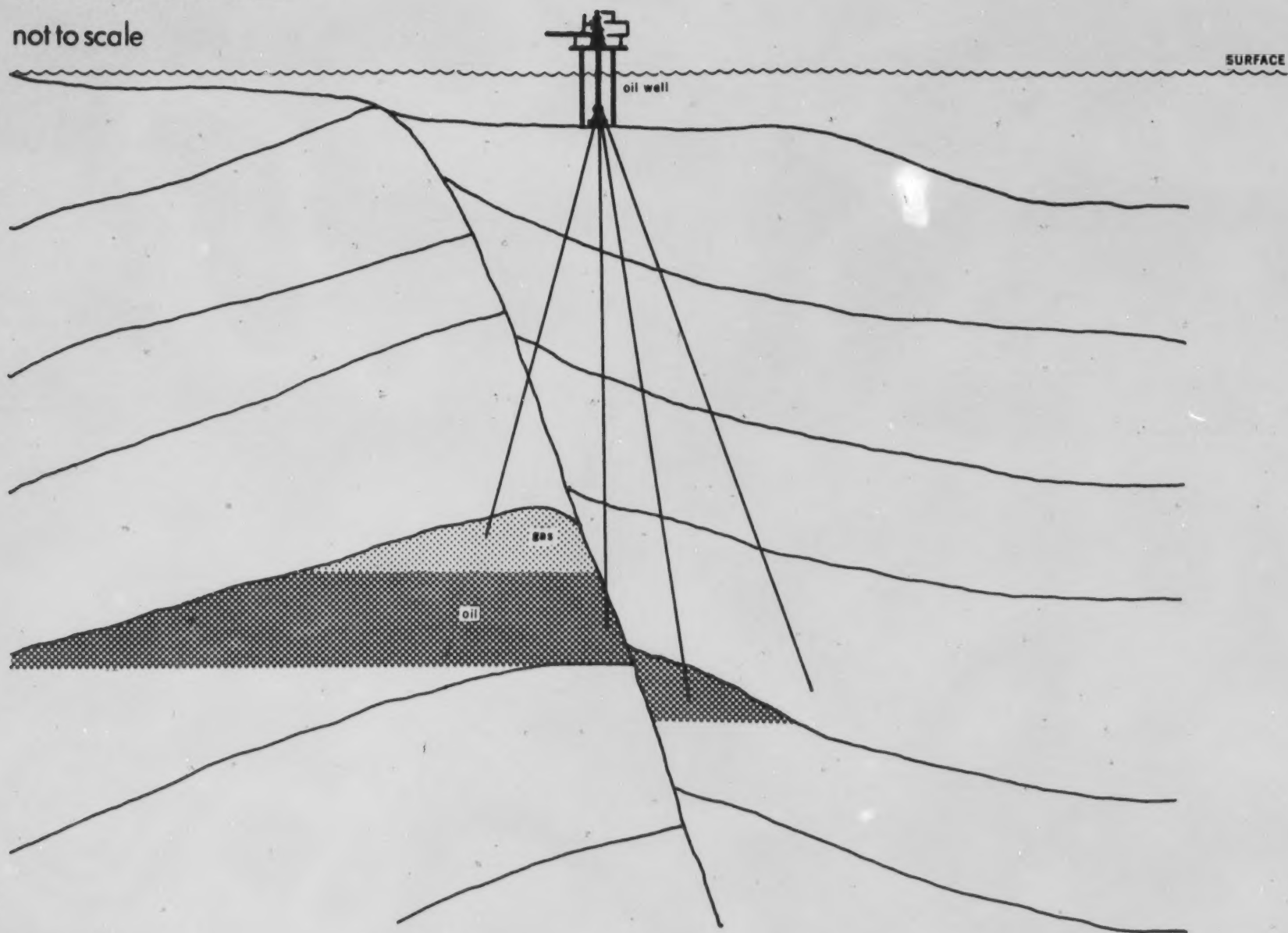
Seismic surveys do not show where the oil and gas can be found. The surveys show only how the rock layers are situated, whether they bend up or down or are shaped upward in the form of a dome. If the layers arch upward (anticline) as in this survey, geologists are hopeful that there is a trap for petroleum. No one will be sure, however, until actual drilling is accomplished.

Some seismic surveys are more difficult to understand than others. Seismic surveys done in faulted areas often have a shattered appearance, and this makes it difficult to see how the rock layers are situated. The seismic survey shown here may be much easier for you to interpret. Can you decide what kind of formation is shown?

INFORMATION SHEET #11

SLANT HOLE DRILLING

not to scale

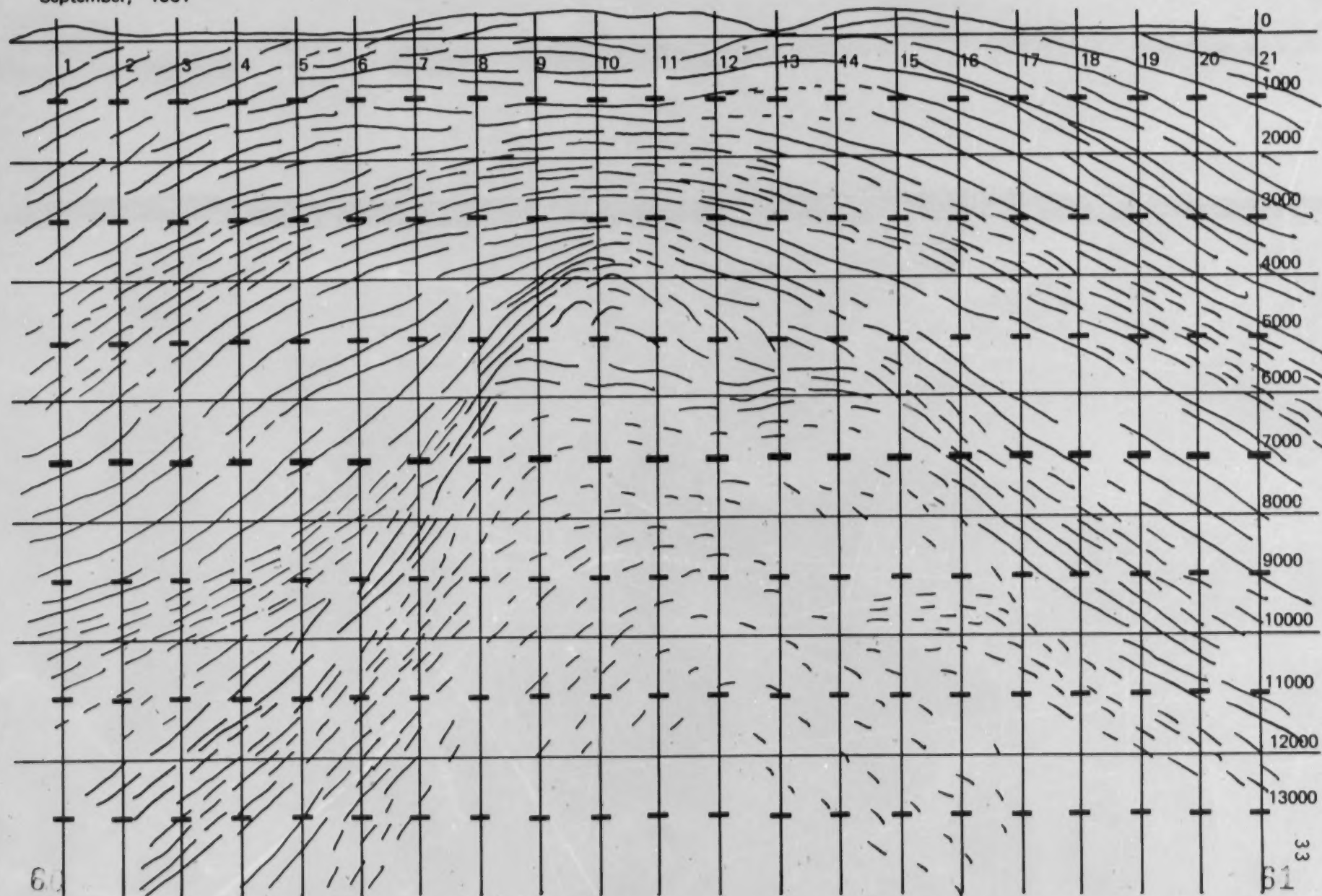


MORNING GLORY RISE SEISMIC SURVEY

Transparency Master

Top layer: limestone

September, 1961



ACTIVITY THREE: WHERE SHALL WE DRILL FOR OIL OR GAS?

Note to the instructor:

The previous activity began preparation for the drilling episode. This activity is a continuation of that preparation period. Now the students will form petroleum companies and actually begin choosing specific drilling sites in Alexandria.

Each area given for drilling is represented by a set of three land profile sheets (Materials #2, #3 and #4 below). The first sheet of each set shows only the profile title, an indication of the major economic activity there, (if any) the ground level or surface line, drill sites and depth markers. (See Figure 1 for further explanation of this sheet.) This first sheet is the one for student use in the drilling activity. The second sheet contains the above information, a diagram of the geological structure beneath the surface line and indicators of the monetary value of any given deposit of oil or gas. (See Figure 2 for further explanation of this sheet.) The students never should see this second sheet unless the teacher wishes for them to see it following completion of the entire experience. The third sheet represents a seismic survey of the geological structure. The students will purchase the seismic surveys for purposes of helping them choose the most promising drill sites. An explanation of a seismic survey was contained on "Information Sheet #10".

During this activity students will receive a copy of "Costs and Earnings: A Guide for Drilling in Alexandria". The use of the guide is explained in the procedure below.

Although the amount of materials and process may appear overwhelming to some at this point, such complexity is necessary if this structural experience is to authentically portray aspects of the real petroleum industry. Also, deeper understanding of decision making in resource acquisition may be achieved if students are somehow actually involved with complexities similar to those in the real business.

Objective:

Given the land profile sheets for specific places in Alexandria, student groups (oil companies) can mark specific sites for possible drilling.

Materials:

1. All materials previously listed in Activity Two.
2. Individual company copies of the following land profile sheets for student use:

Anaconda Plateau
 Benedict Flats
 Calistoga Valley
 Cardiff Sea
 Central Uplift
 Colville Incline
 Domal Mountains
 Freewater Dome
 McCleary Mountains
 Mercedes Beach
 Morning Glory Rise
 Smithville County

Each of these places is shown on the map of the Republic of Alexandria.

3. The profile sheets for teacher use only
4. Seismic surveys of each of the above profiles (for student purchase).
5. "Costs and Earnings: A Guide for Drilling in Alexandria."
 (one or two copies for each company.)

Procedure:

TASK

1. The students begin the activity by forming into groups representing oil companies. There should be no more than four members to a group or company. The teacher can explain this limitation as a government antimonopoly measure. The teacher may allow some students to operate individually if they wish. Each company should name itself.
2. Immediately after forming, each company receives the twelve land profile sheets for student use in finding petroleum deposits. The instructor should (1) explain how each profile per-

RESPONSE

Most students will choose to join forces for purposes of pooling resources (minds and money notes) and establishing divisions of labor for efficiency during subsequent drilling.

The students will be somewhat dismayed by the fact that the land profile sheets for their use do not contain the geological information necessary for determining the exact location of

tains to a specific site in one of the areas shown on the map of Alexandria and (2) explain the nature of the land profile sheets. (See page 38 of this guide.)

3. Almost as soon as the land profile sheets have been explained, the teacher should (1) assure the groups that seismic surveys are available for purchase, and (2) that even though each group has the profile and seismic for Morning Glory Rise, it is not now available for exploration and drilling. The teacher can explain that several powerful groups have blocked any development in that area. The groups believe that drilling will spoil the landscape and that Morning Glory Rise may then become a less desirable place for people to live. They have also stated that some oil and gas should be saved for a future time.

4. In this final phase each company should receive a copy of "Costs and Earnings: A Guide for Drilling in Alexandria". With this guide, the information sheets, the money notes for purchasing seismic surveys and the land profile sheets, each group (company) can now choose some sites for drilling.

petroleum. Many will immediately ask if seismic surveys are available and will be quick to discover that the seismic survey for Morning Glory Rise is among the information sheets given in Activity Two.

The students will in good-natured manner express verbal disapproval of having to buy seismics and not being able to drill in Morning Glory.

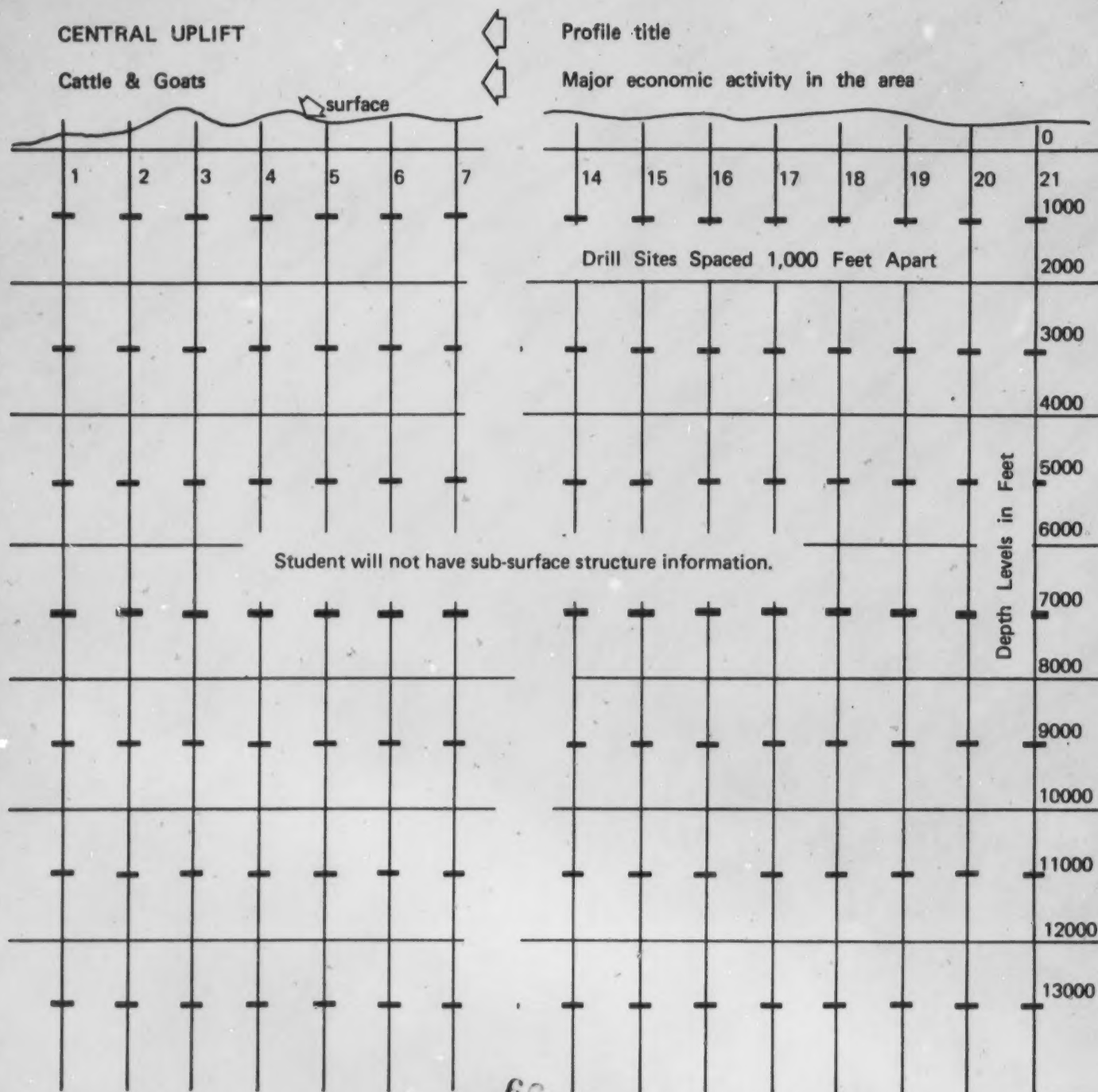
The class should hum with activity as the students pour over the resource material and actually pin down specific drill sites. Some complain because they don't have enough money to purchase each of the seismic surveys. In order to secure what is desired, companies may begin dealing among each other. For example,

The teacher should explain that each group may borrow additional money during the next activity since undoubtedly every group will need more money notes. (The costs and earnings guide clearly implies this.)

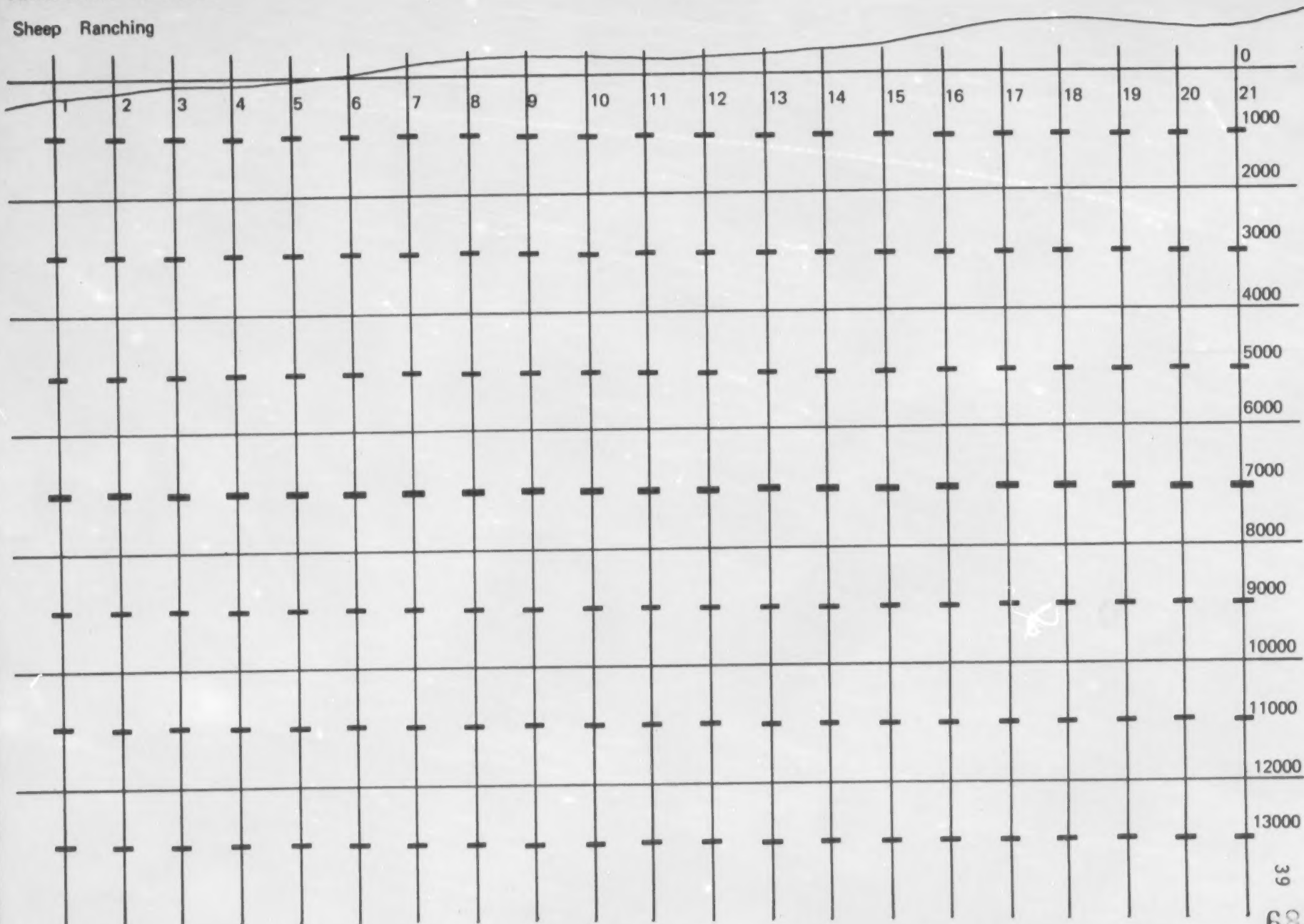
one company may write a promisory note to another company so they can purchase or lease a survey owned by that other company.

The teacher can now sell seismic survey sheets. Every group should have enough money notes to purchase several sheets. It should be noted that a company does not have to buy any survey; they can "wildcat" or choose a site with little knowledge of the sub-surface structure. The consequence of choosing this action (wildcatting) is that a higher rate of interest will be charged on money borrowed from the bank. This increased interest rate is due to the higher risk factor involved in wildcatting. (It is a fact that oil operators have secured better loans when they had good surveys in their possession.)

FIGURE 1
EXPLANATION OF LAND PROFILE SHEETS
(Sheets for Student Use)

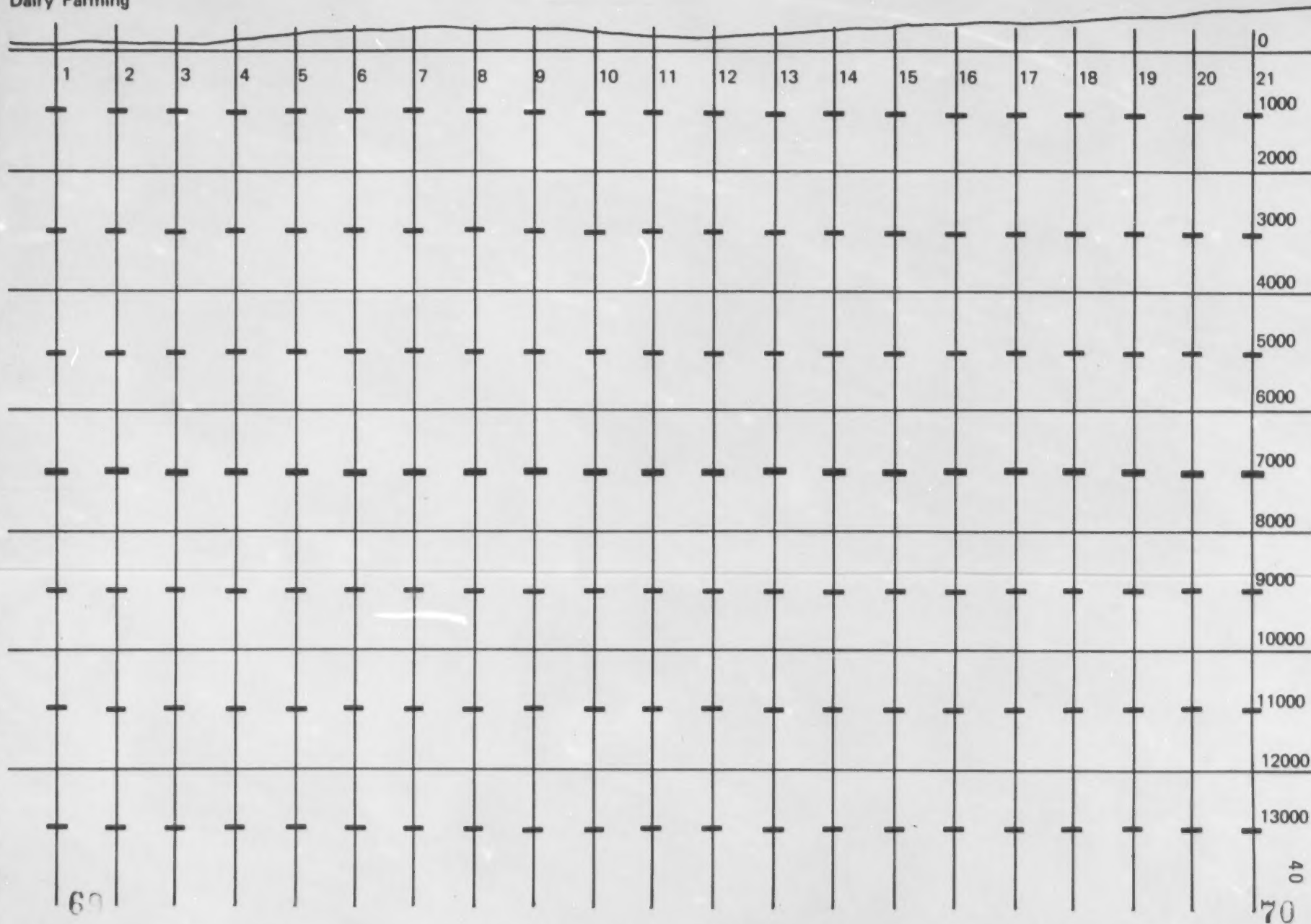


Sheep Ranching



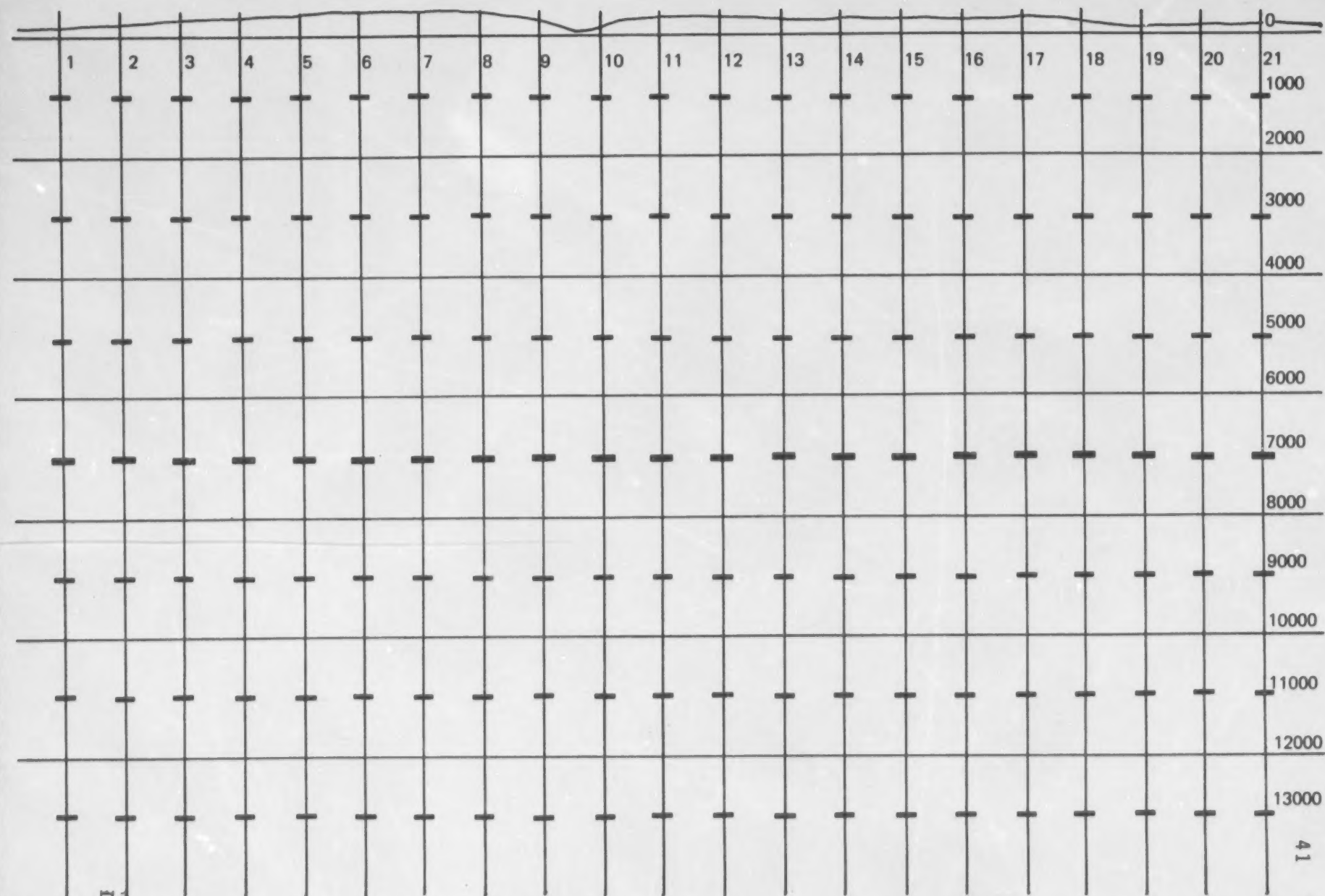
BENEDICT FLATS

Dairy Farming

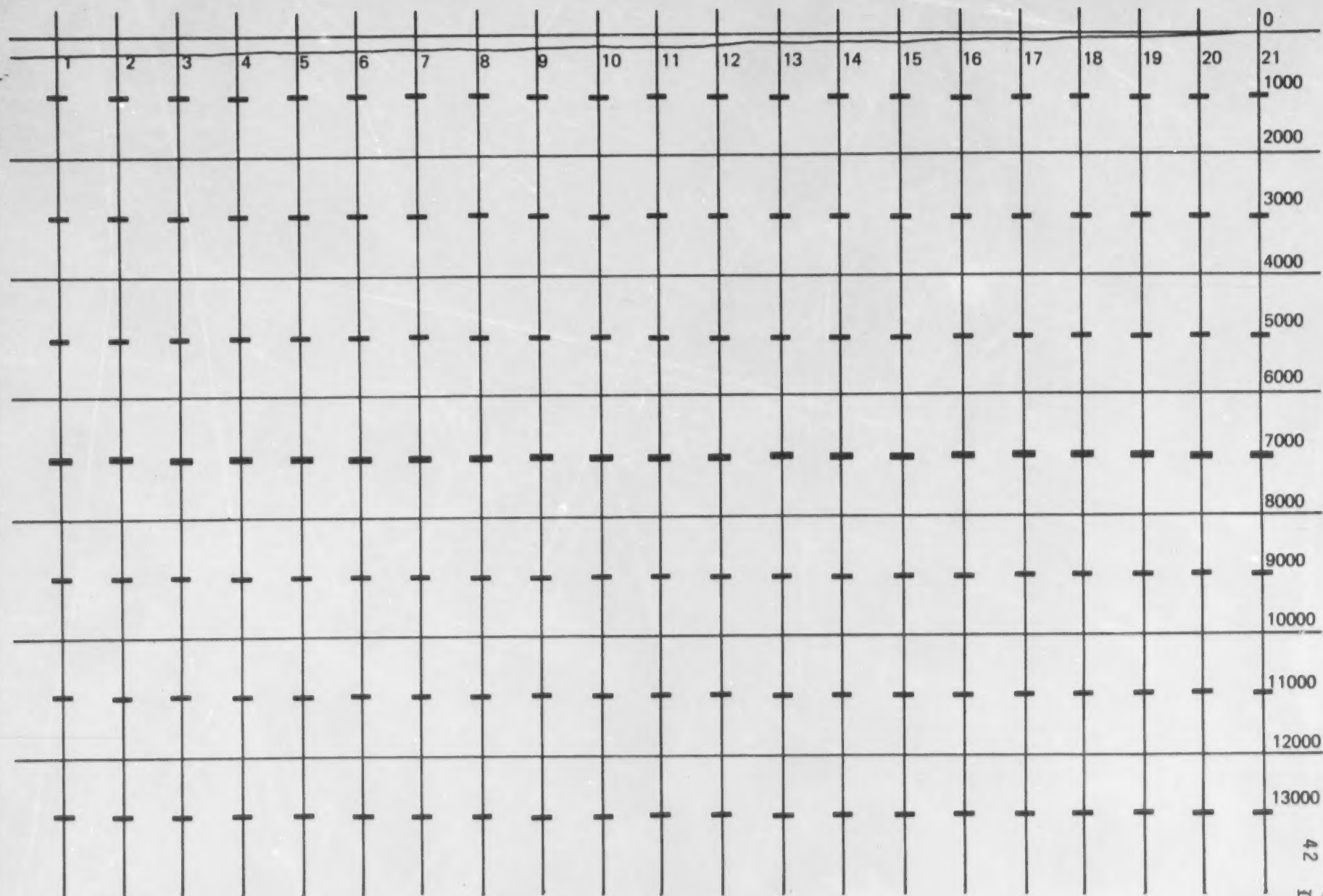


CALISTOGA PROFILE

Vegetable and Fruit Farming

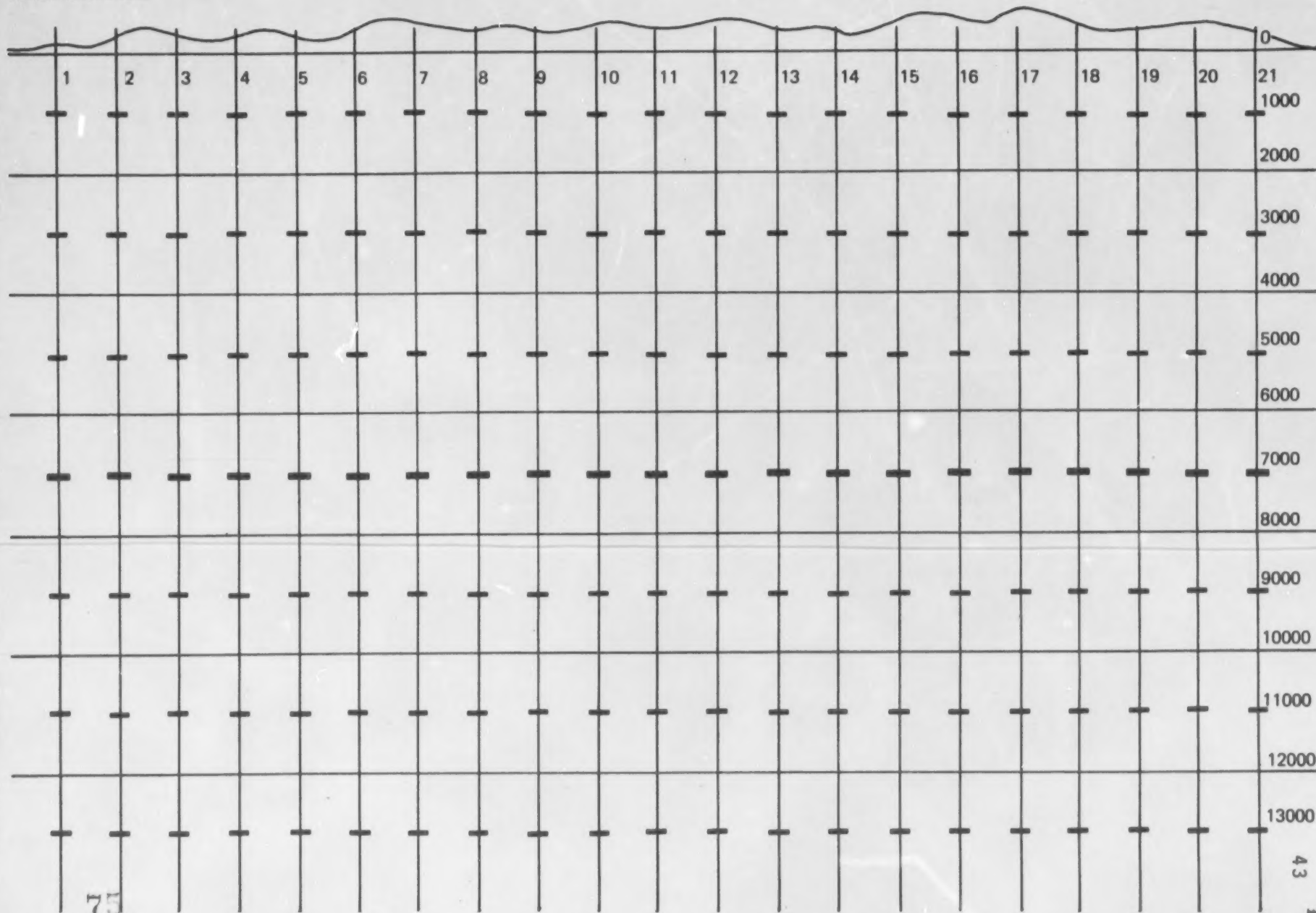


CARDIFF SEA
Shrimp Fishing



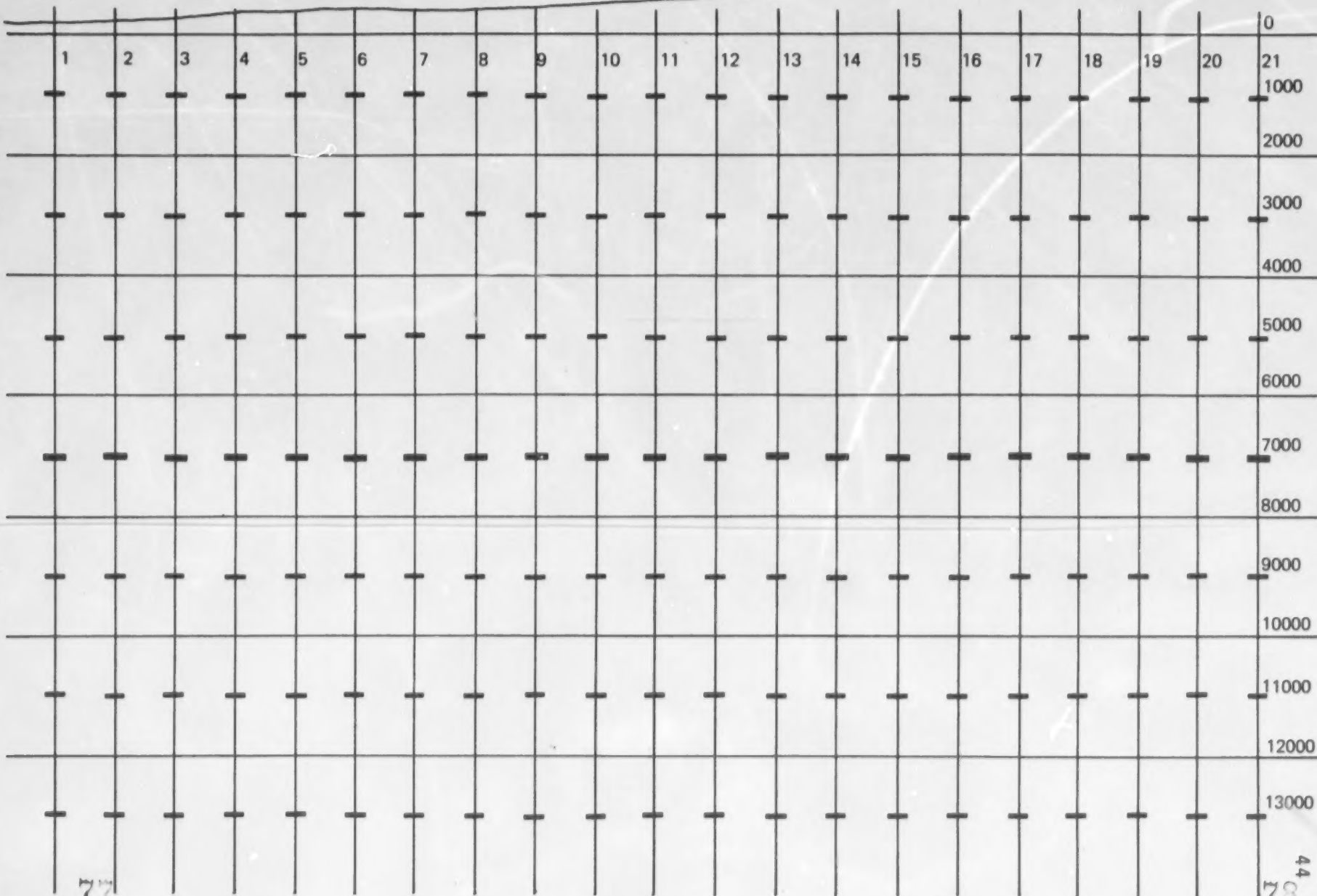
CENTRAL UPLIFT

Cattle and Goats

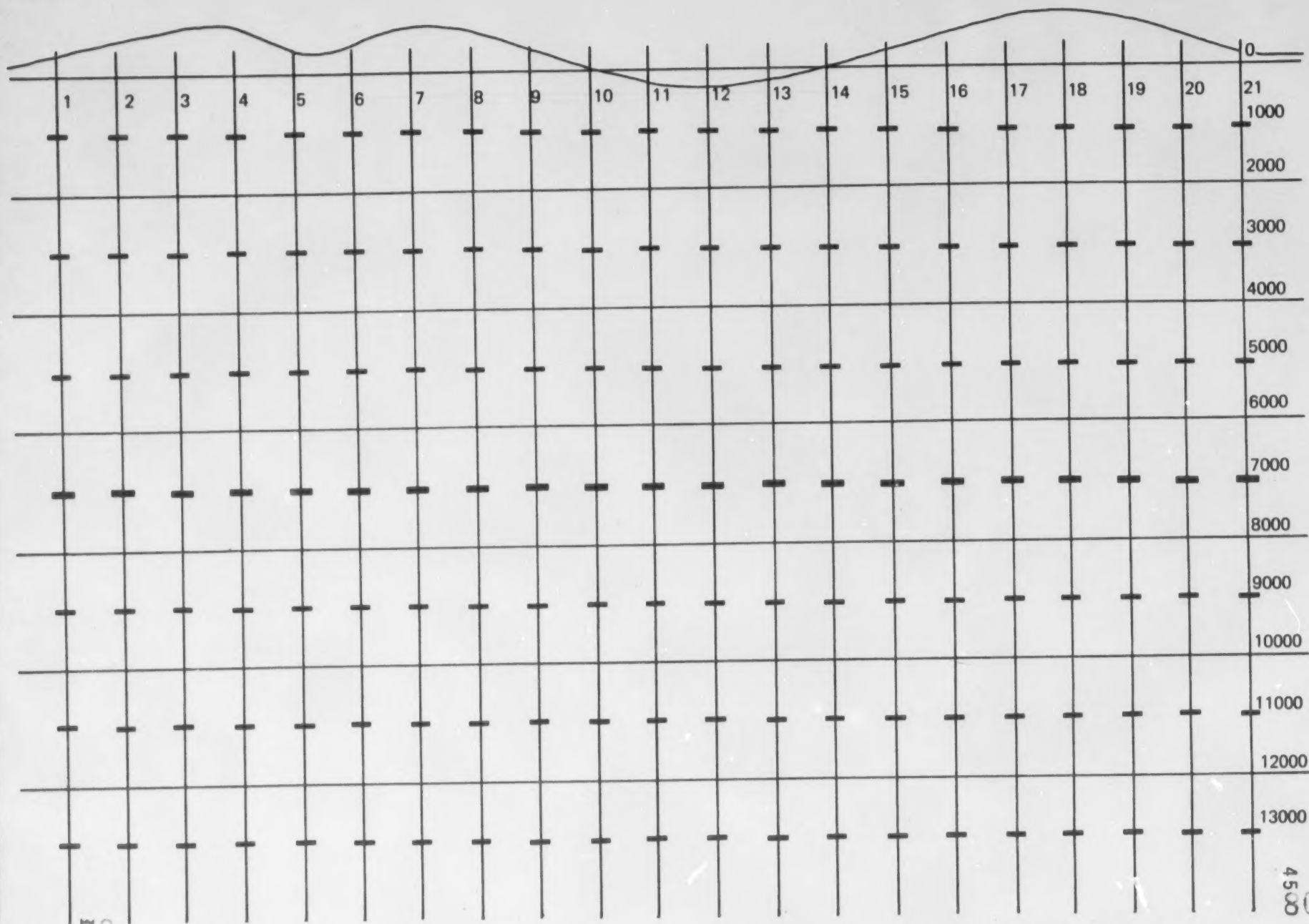


COLTVILLE INCLINE

Irrigation Farming

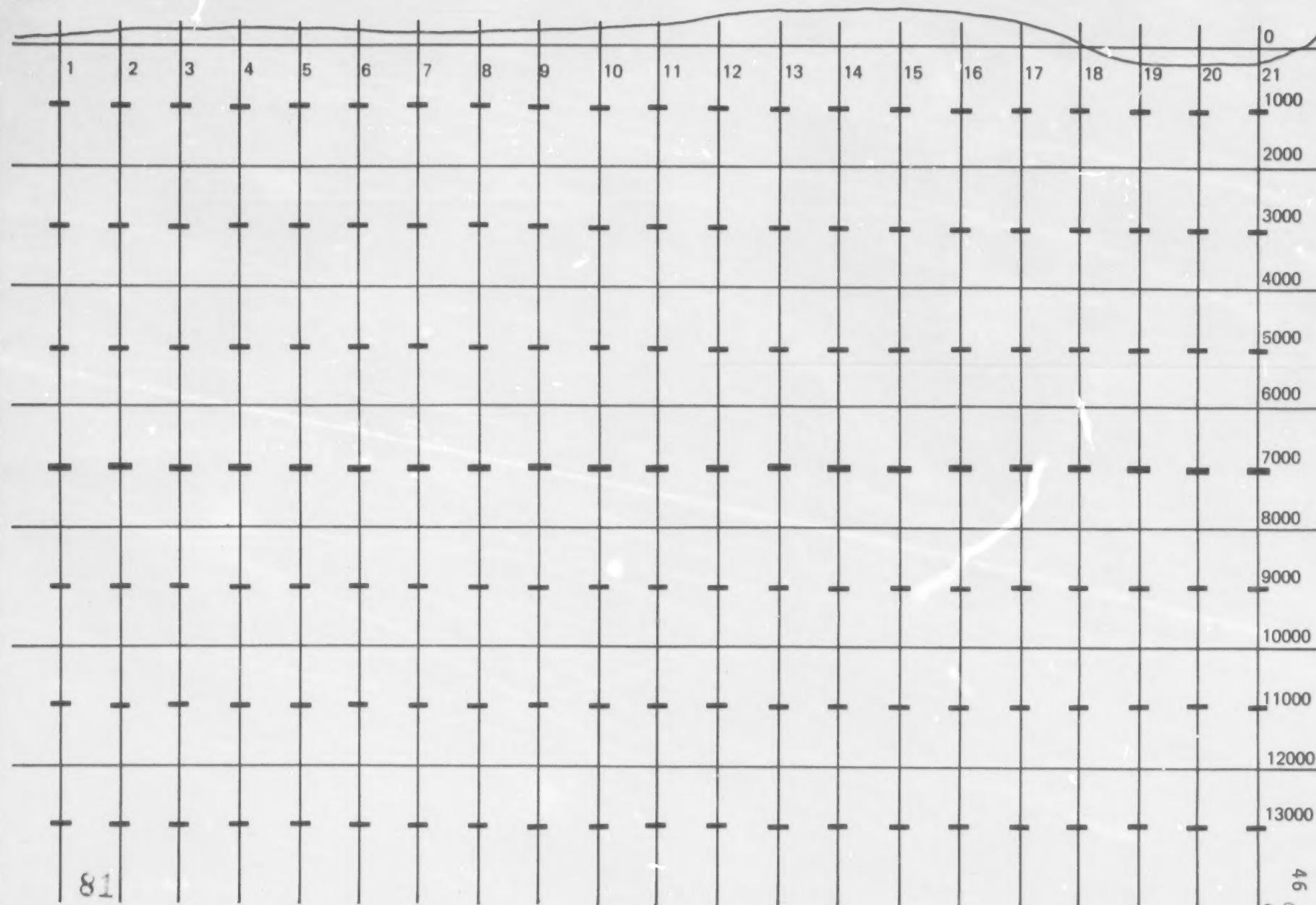


DOMAL MOUNTAINS



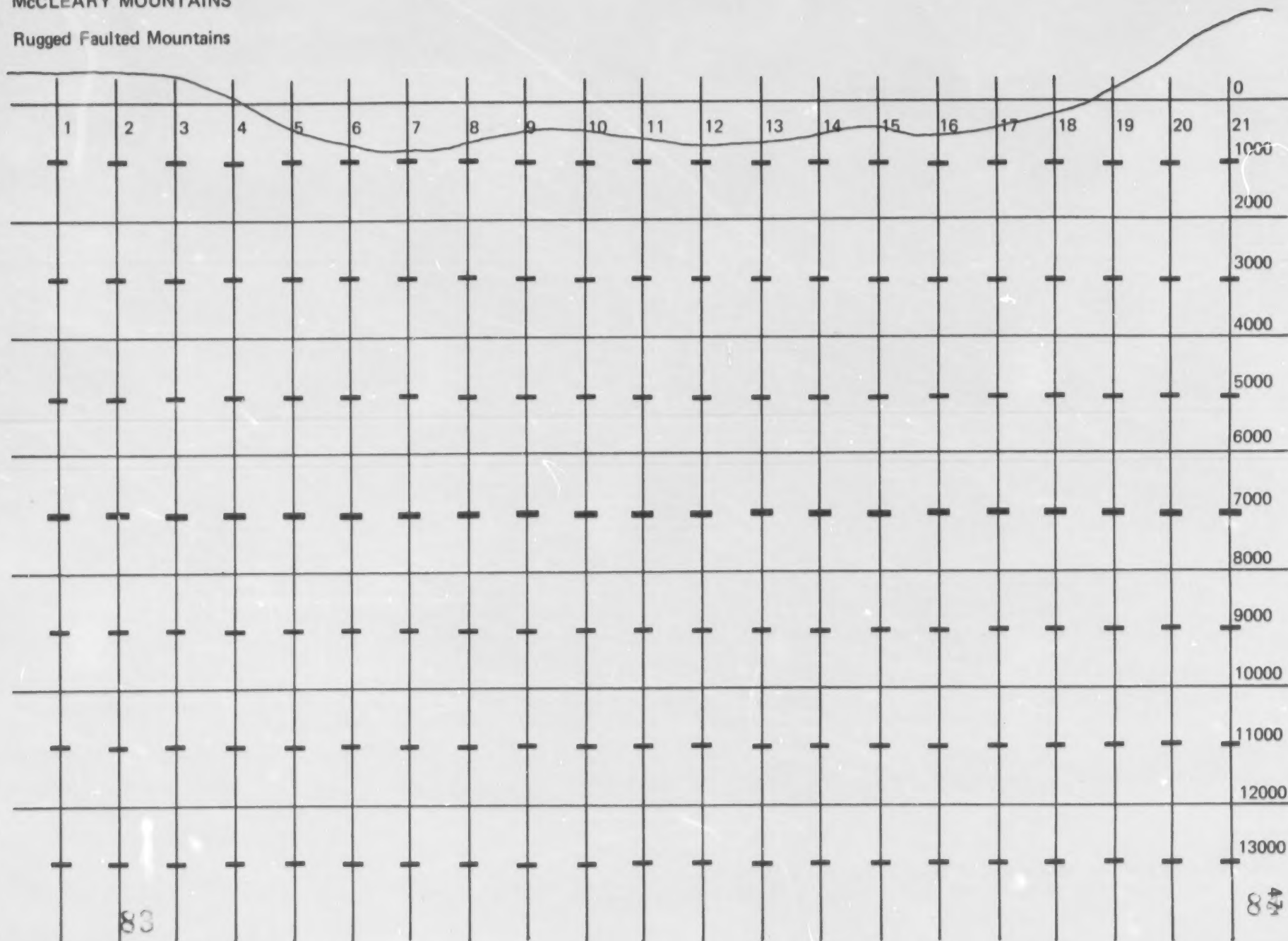
FREE WATER DOME

Cattle

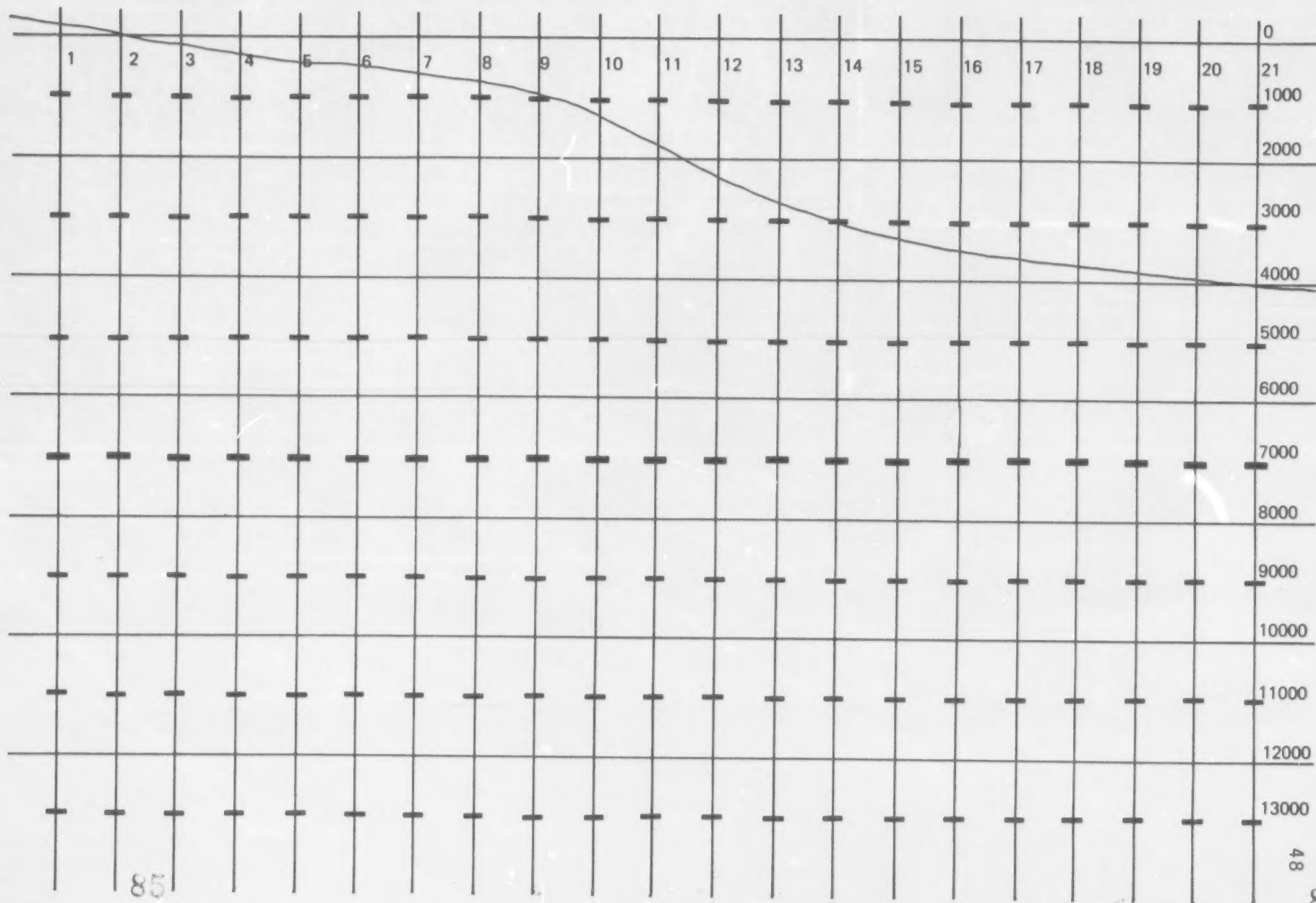


McCLeary Mountains

Rugged Faulted Mountains

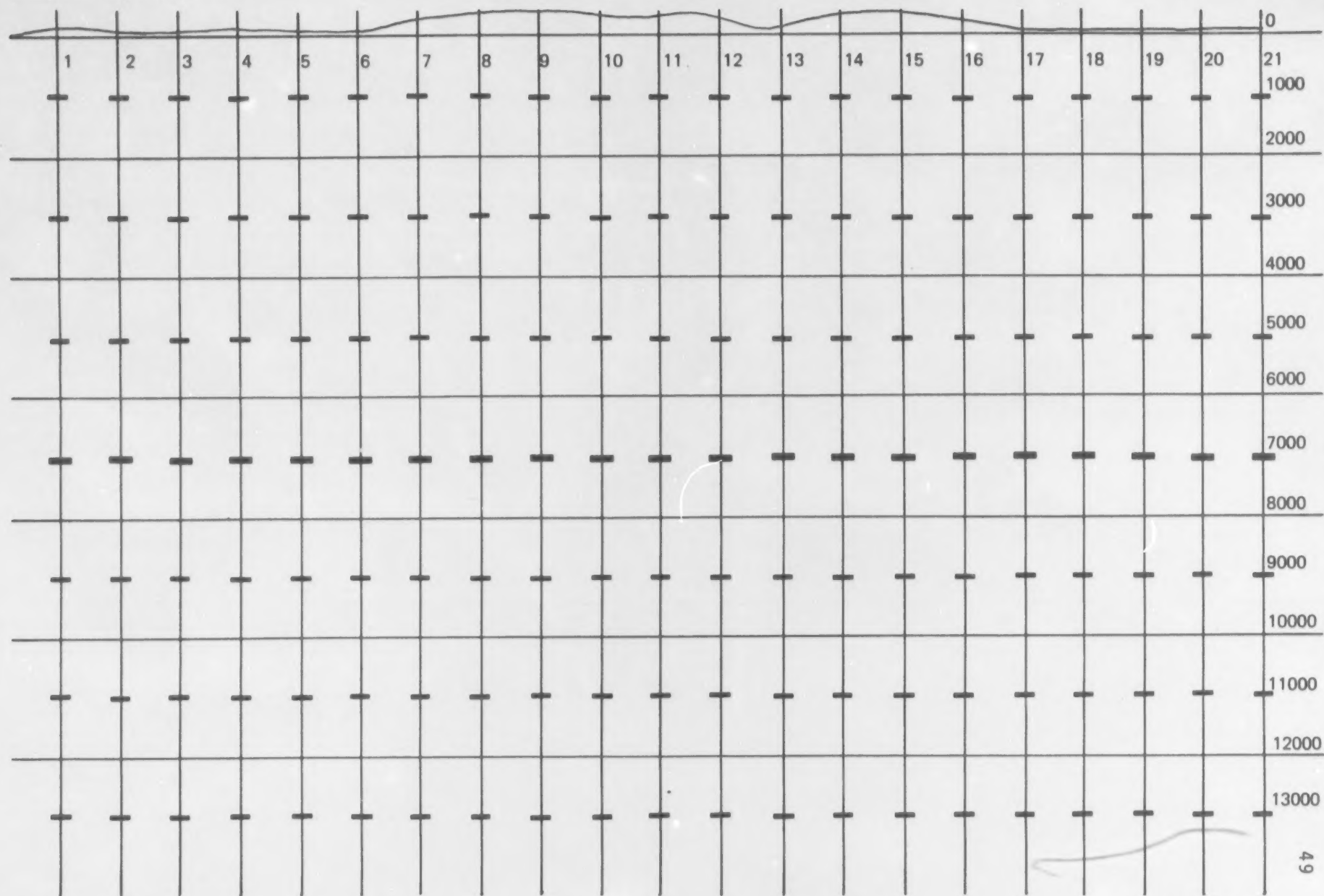


MERCEDES BEACH



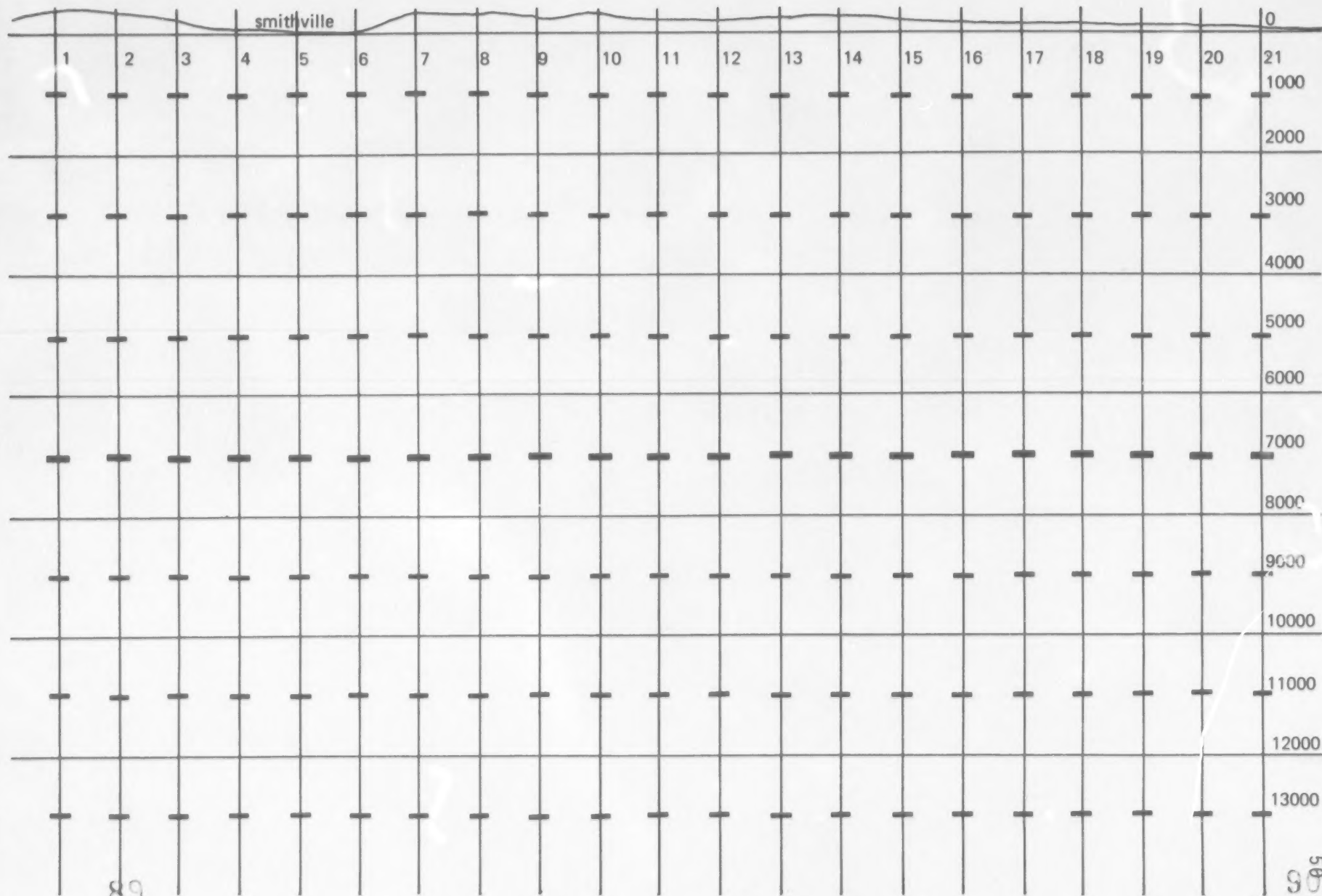
MORNING GLORY RISE

Exclusive Troy Suburb



SMITHVILLE PROFILE

Cattle

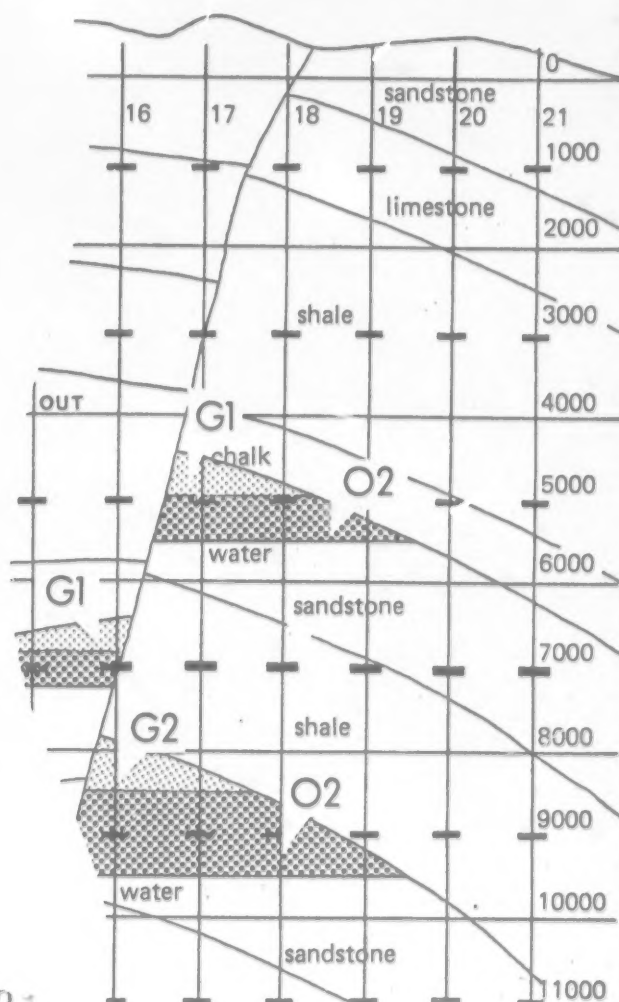
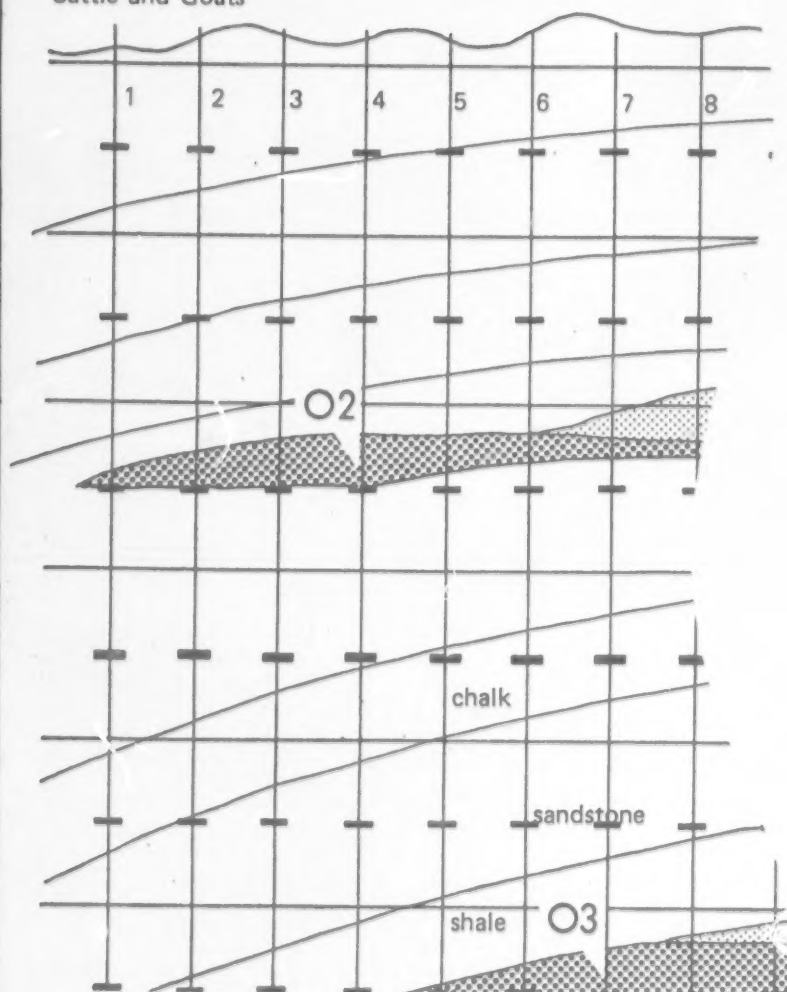


EXPLANATION OF FIGURE 2 LAND PROFILE SHEET (Sheets for Teacher Use)

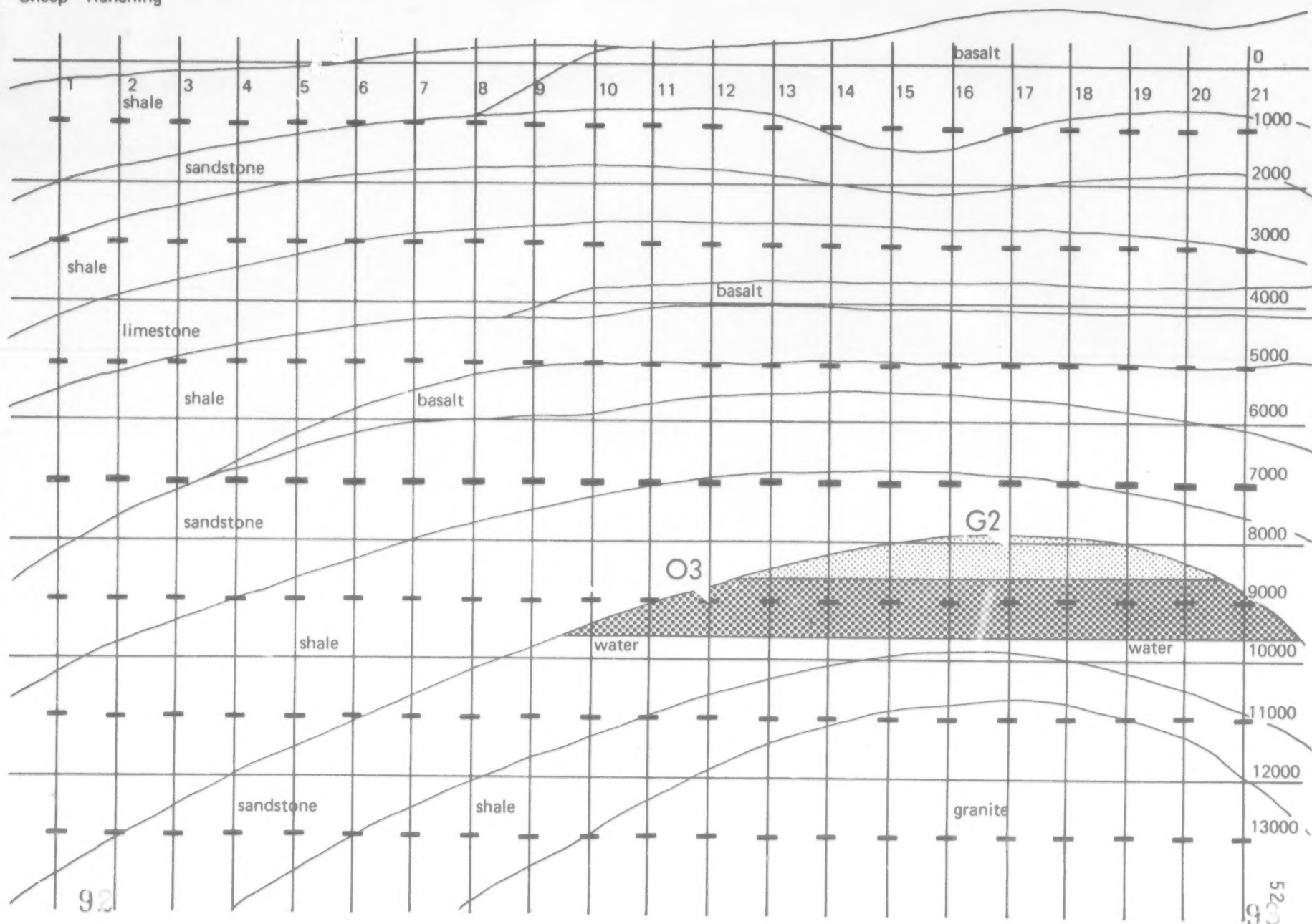
1. Each sub-surface rock layer is labeled
2. These symbols indicate the money value of the oil or gas in each pool. G2 means "gas two" or a gas pool worth twenty notes of one value each. The O3 means "oil three" and a company can collect thirty notes of one value each if they strike anywhere in this pool. (This is a good field.) Page 5 of the Costs and Earnings guide contains a fuller explanation.

CENTRAL UPLIFT

Cattle and Goats

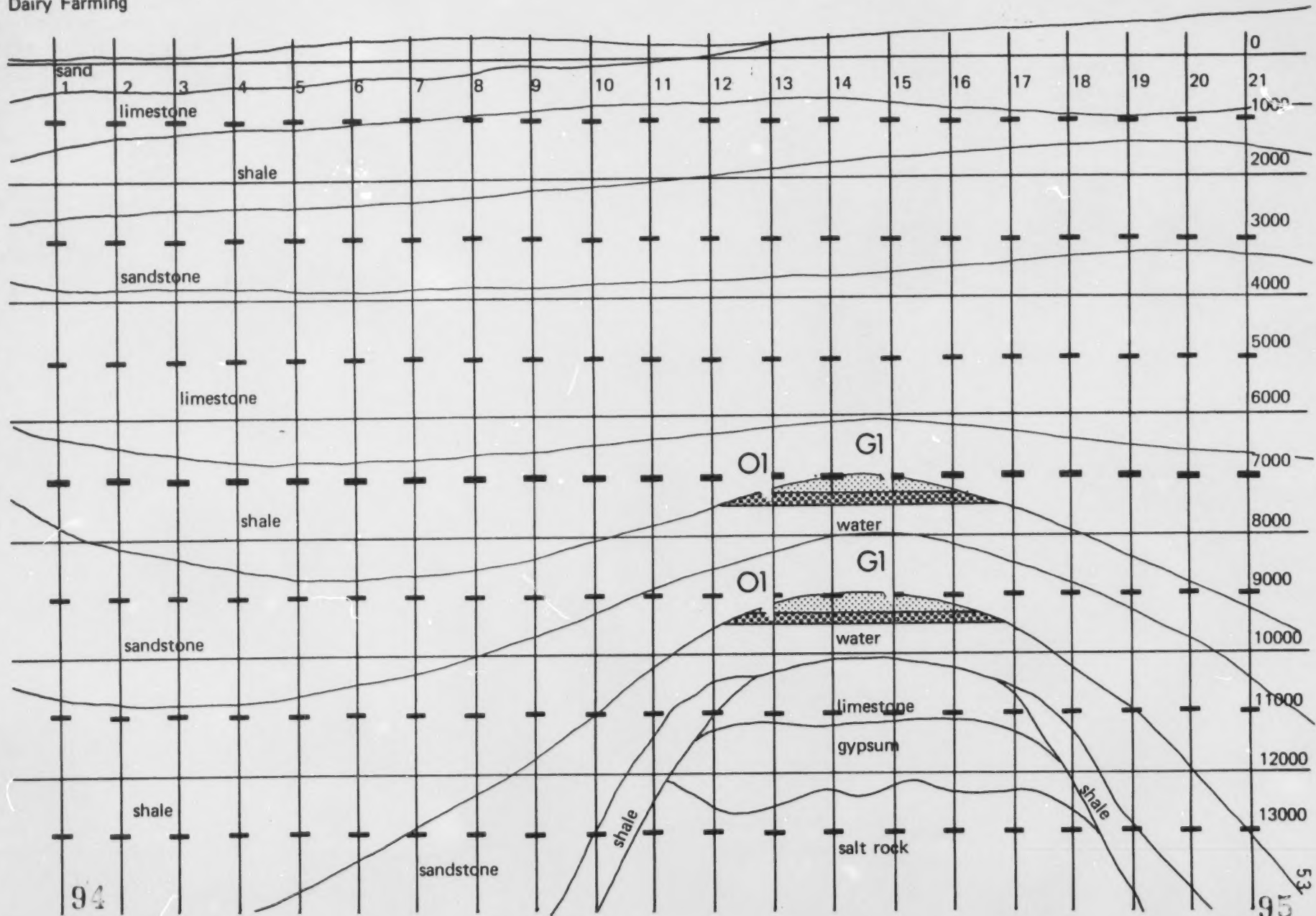


Sheep Ranching

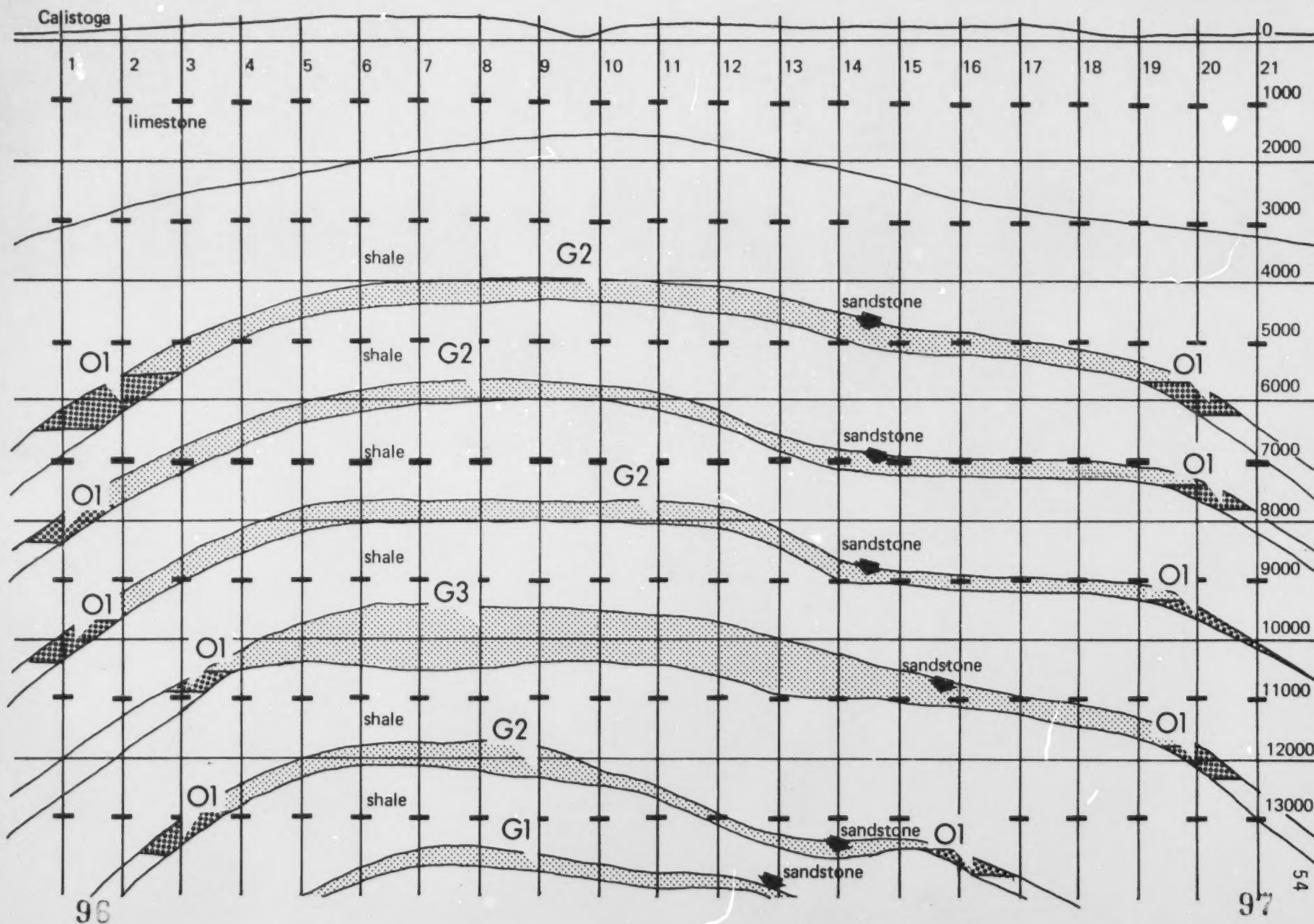


BENEDICT FLATS

Dairy Farming

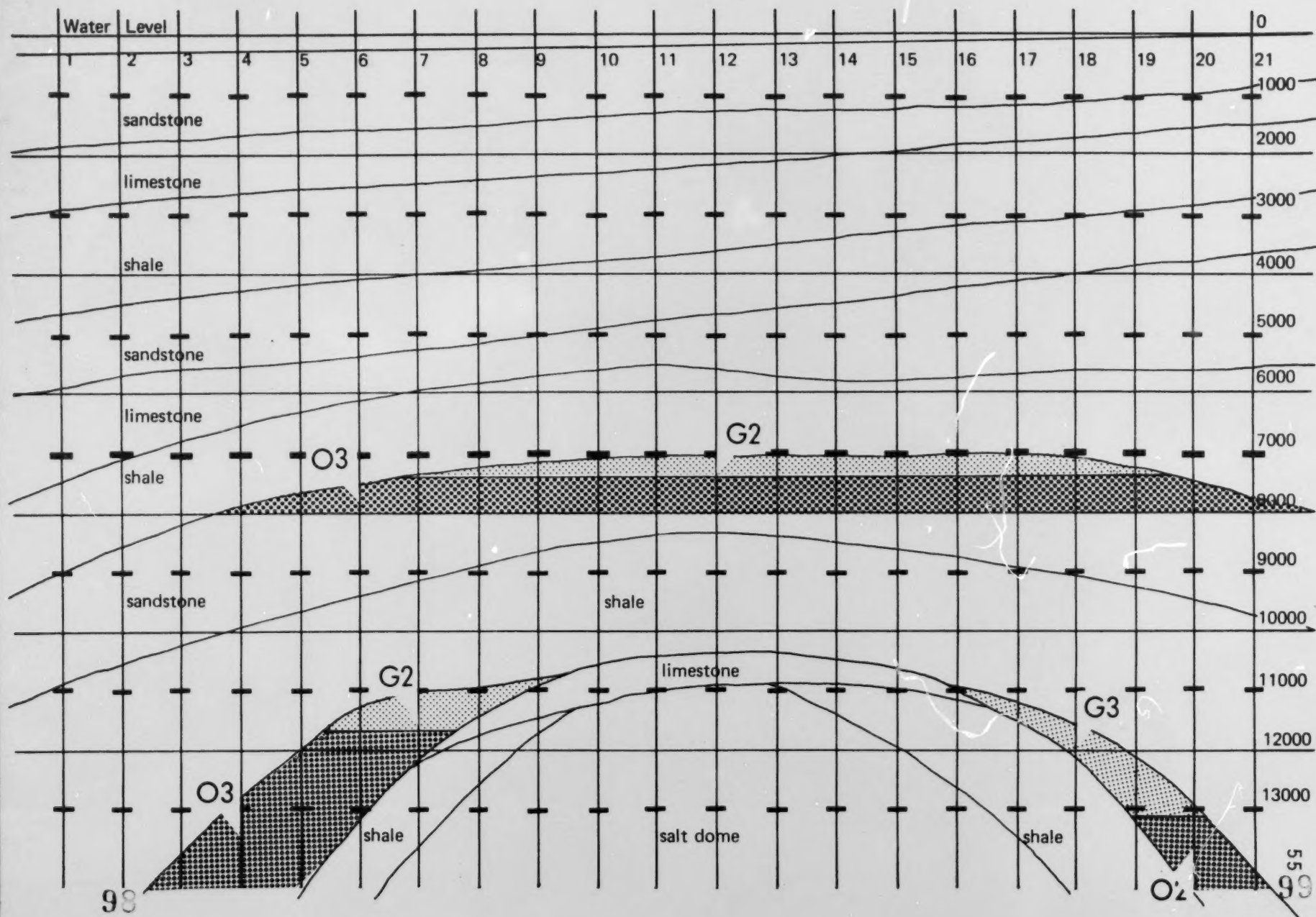


Vegetable and Fruit Farming



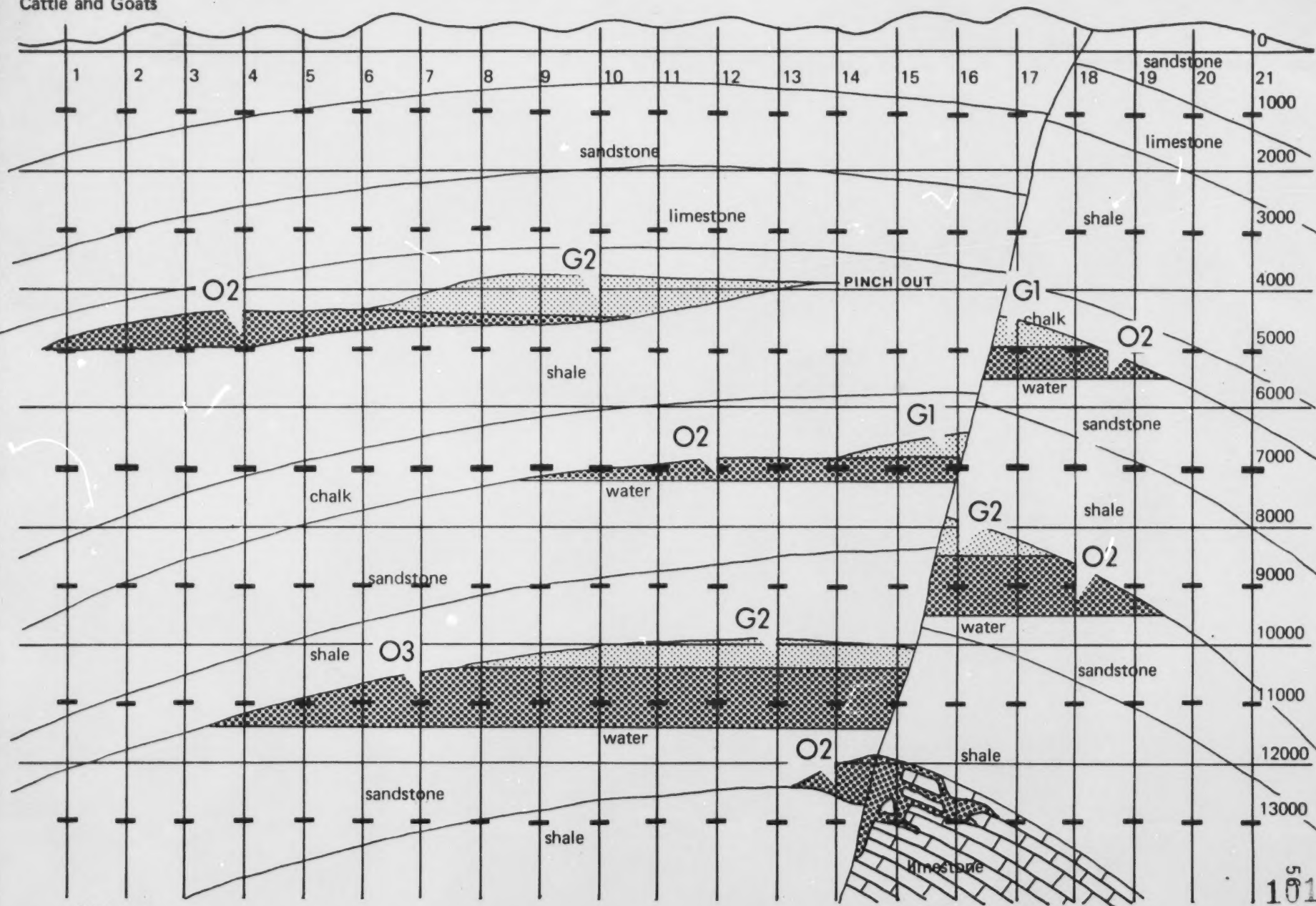
CARDIFF SEA

Shrimp Fishing



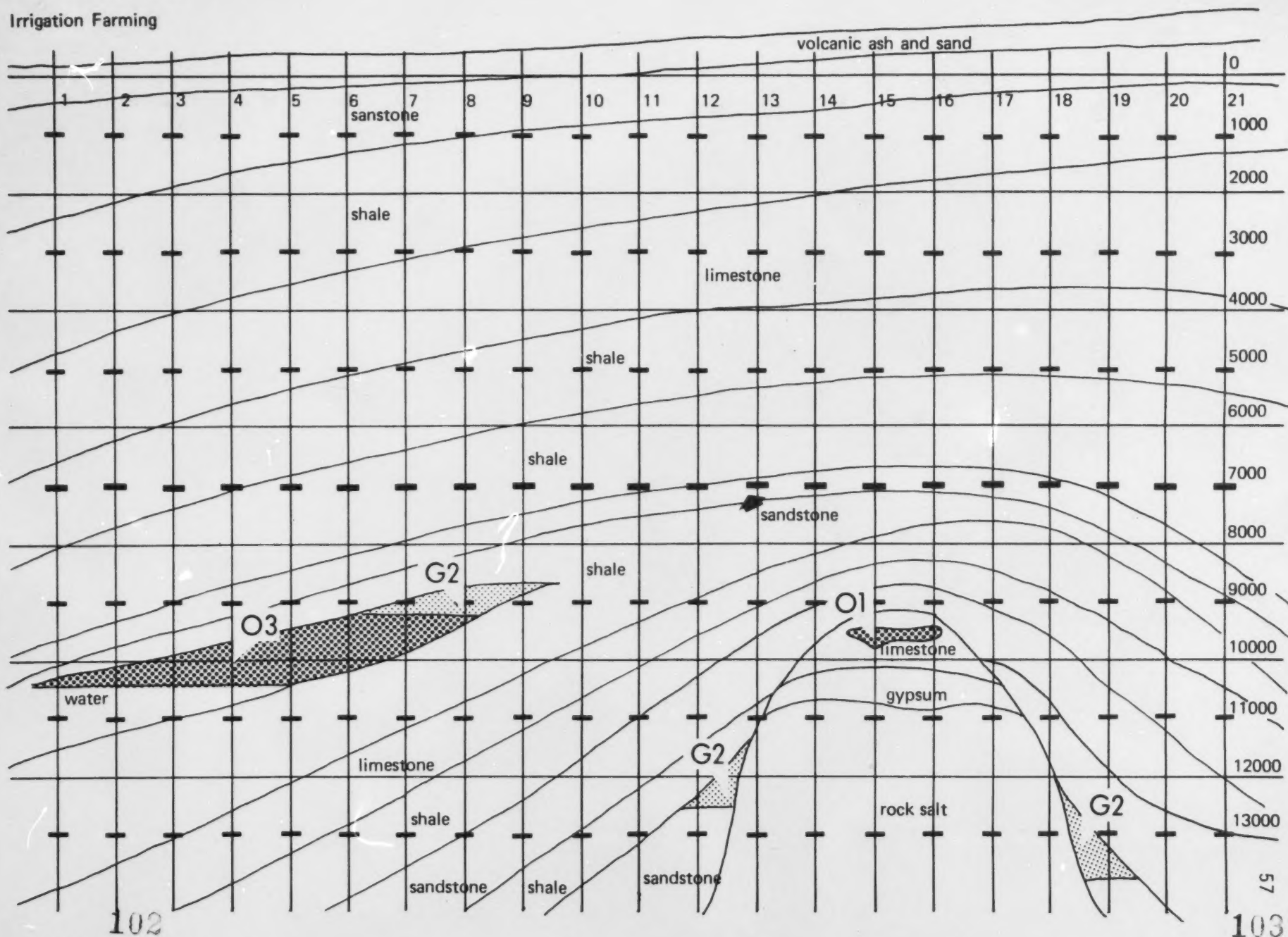
CENTRAL UPLIFT

Cattle and Goats

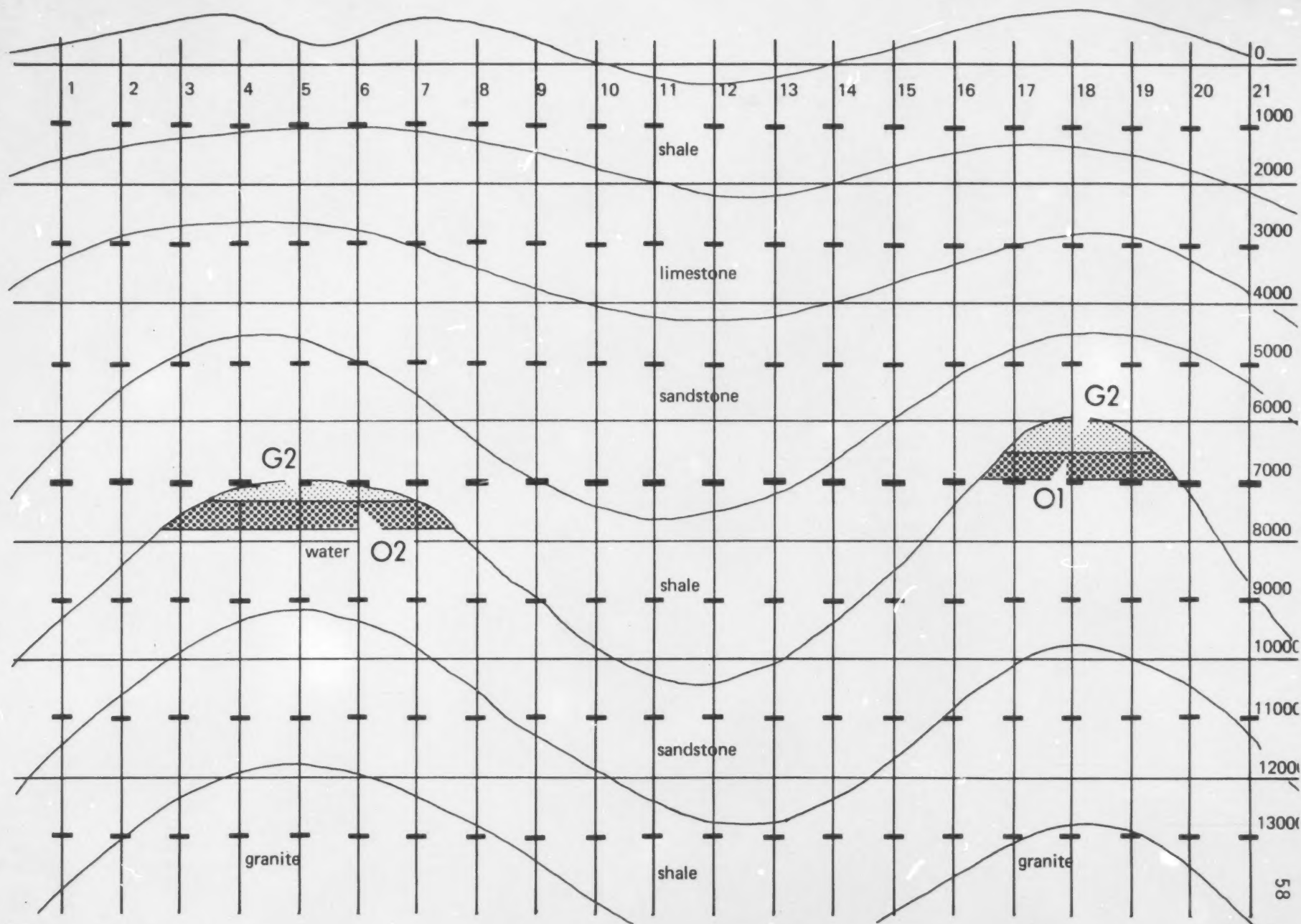


COLTVILLE INCLINE

Irrigation Farming



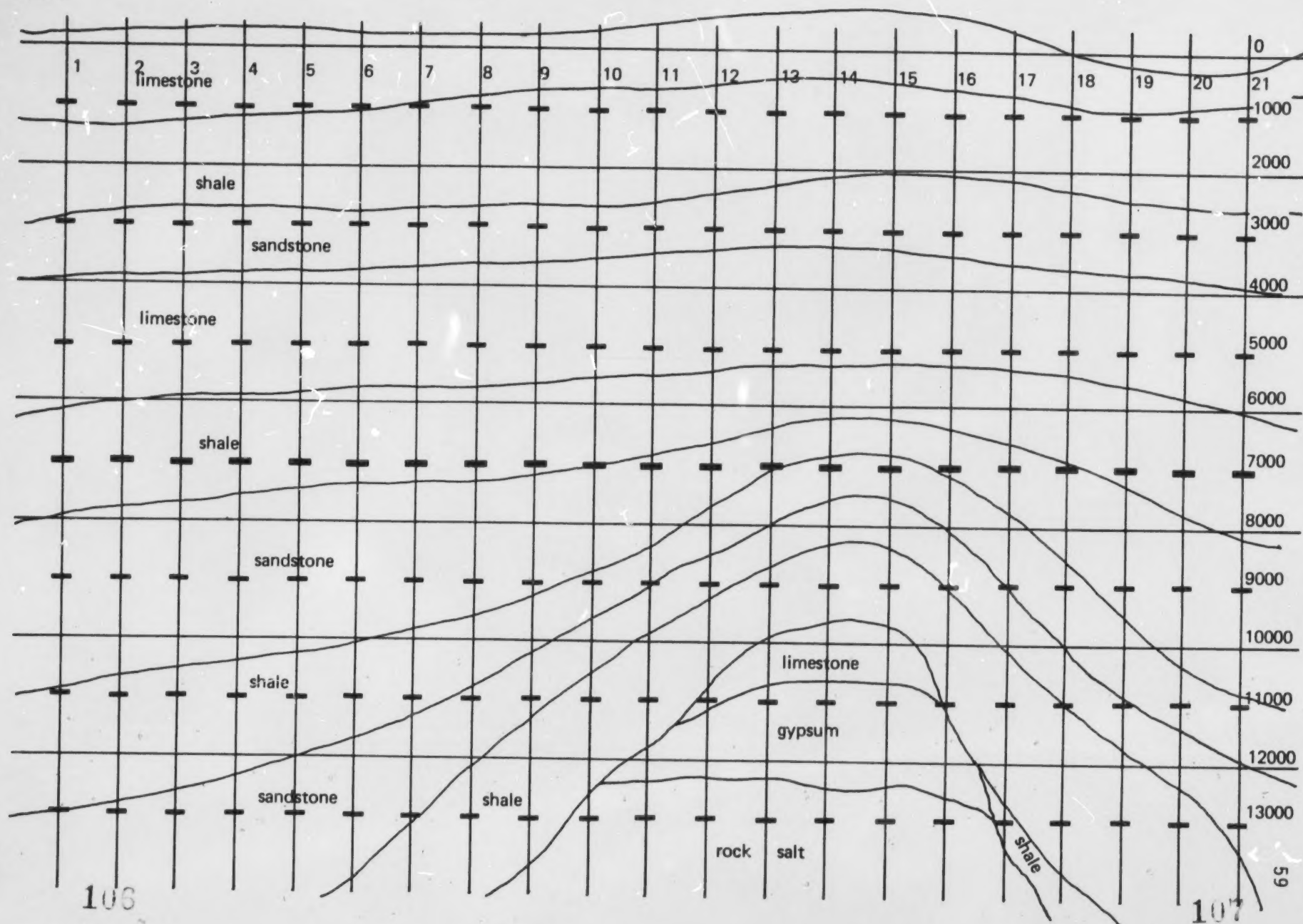
DOMAL MOUNTAINS



FREE WATER DOME

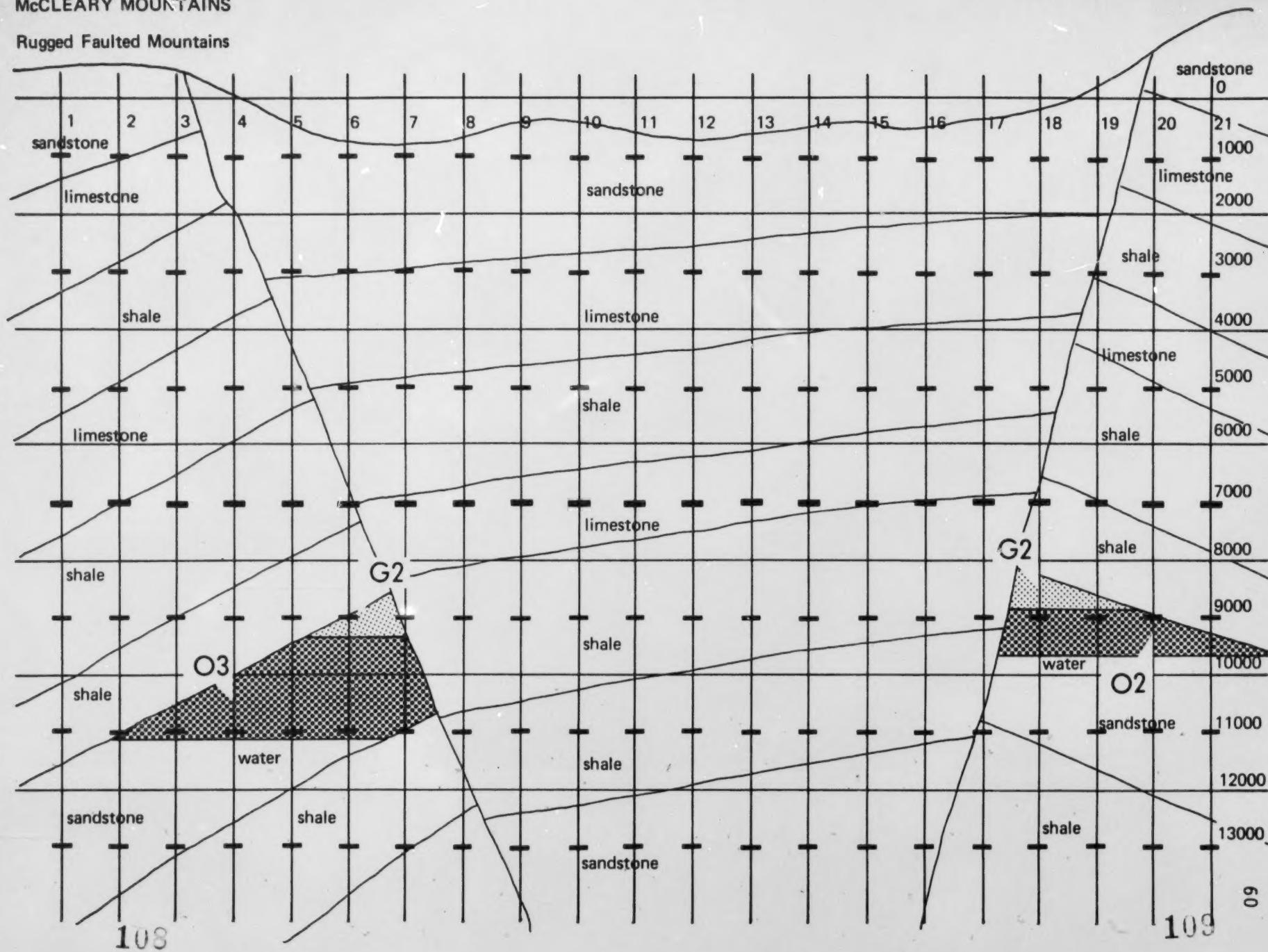
Cattle

Note to teacher: There is no oil or gas in this profile.

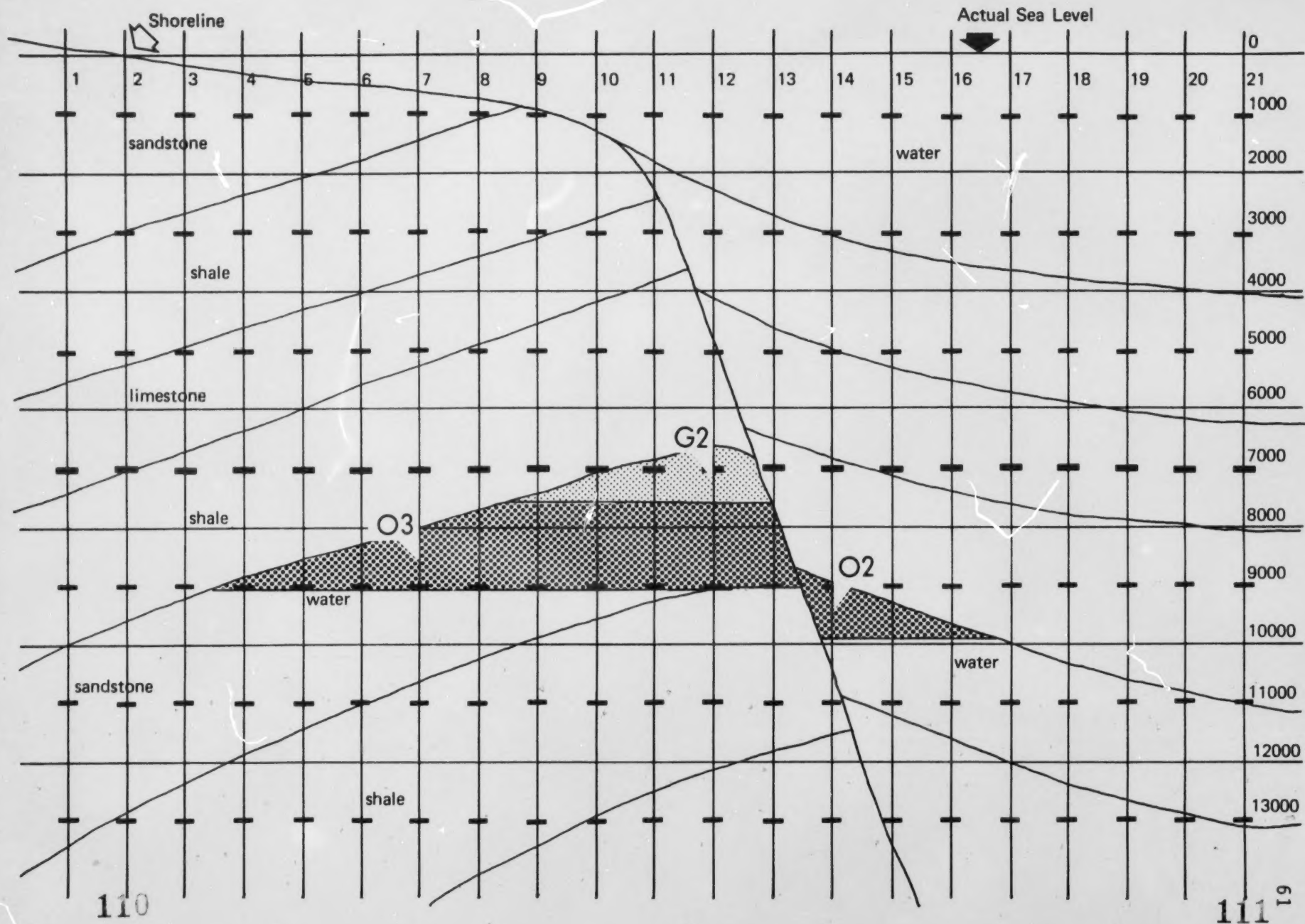


McCLeARY MOUNTAINS

Rugged Faulted Mountains

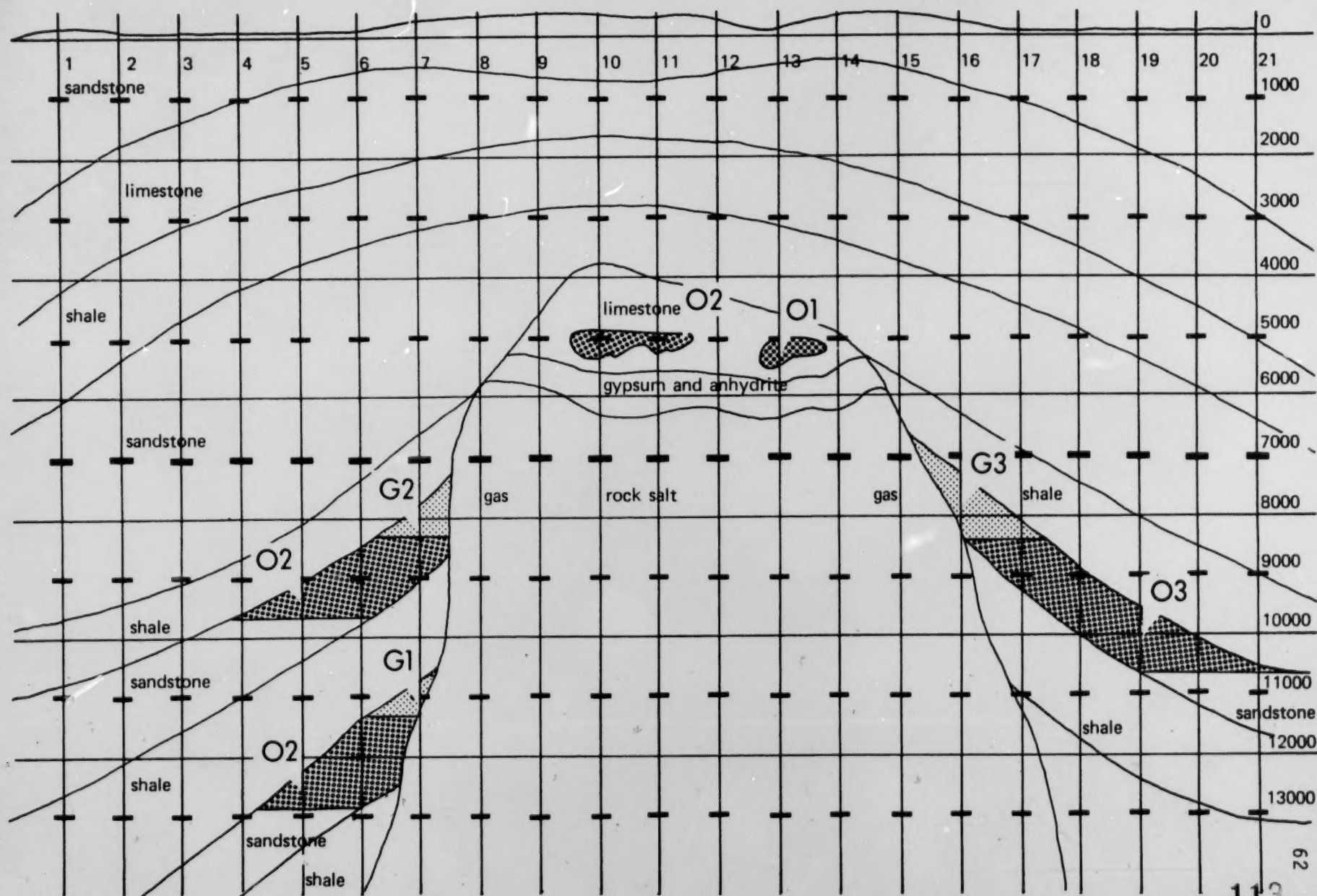


MERCEDES BEACH



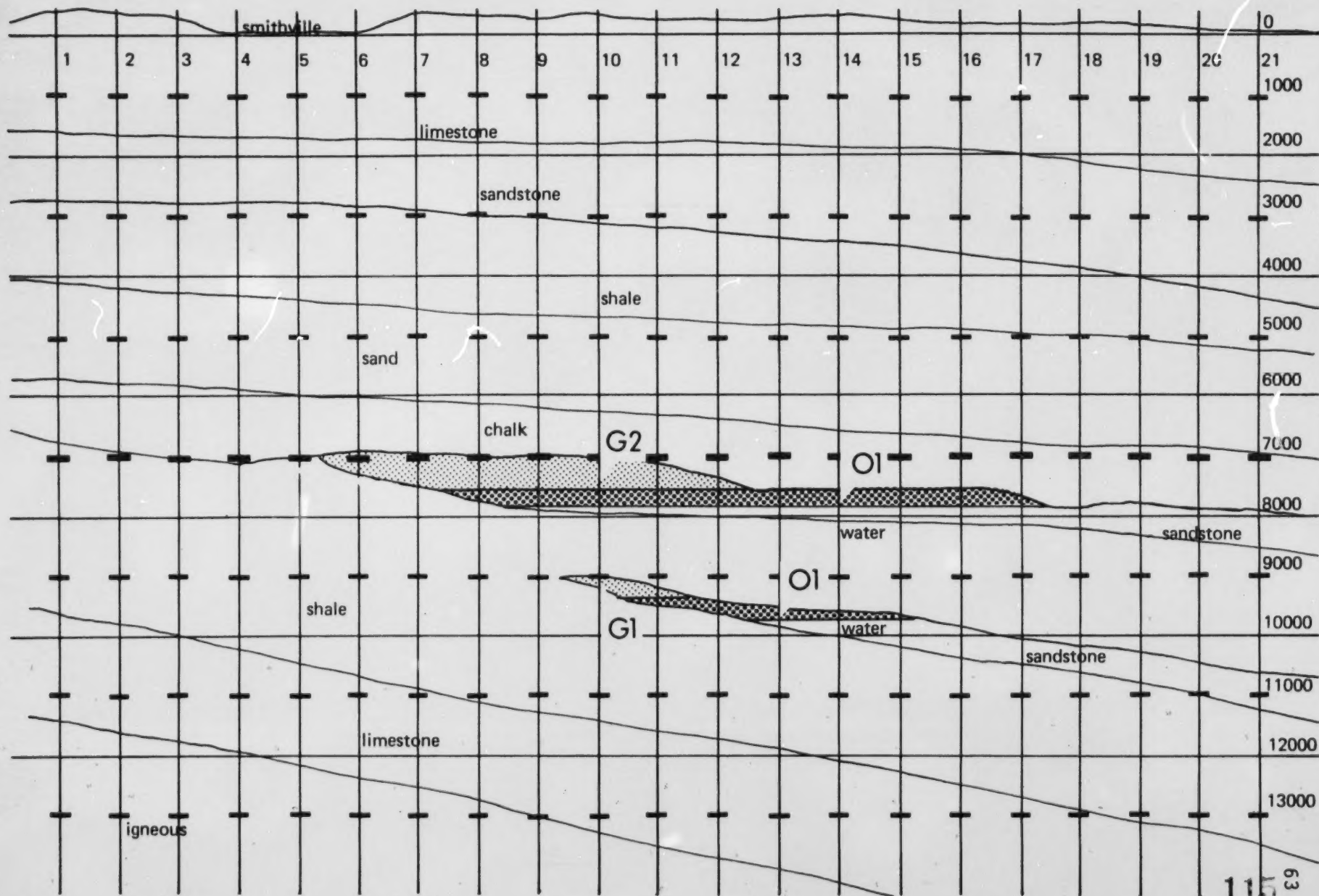
MORNING GLORY RISE

Exclusive Troy Suburb



SMITHVILLE PROFILE

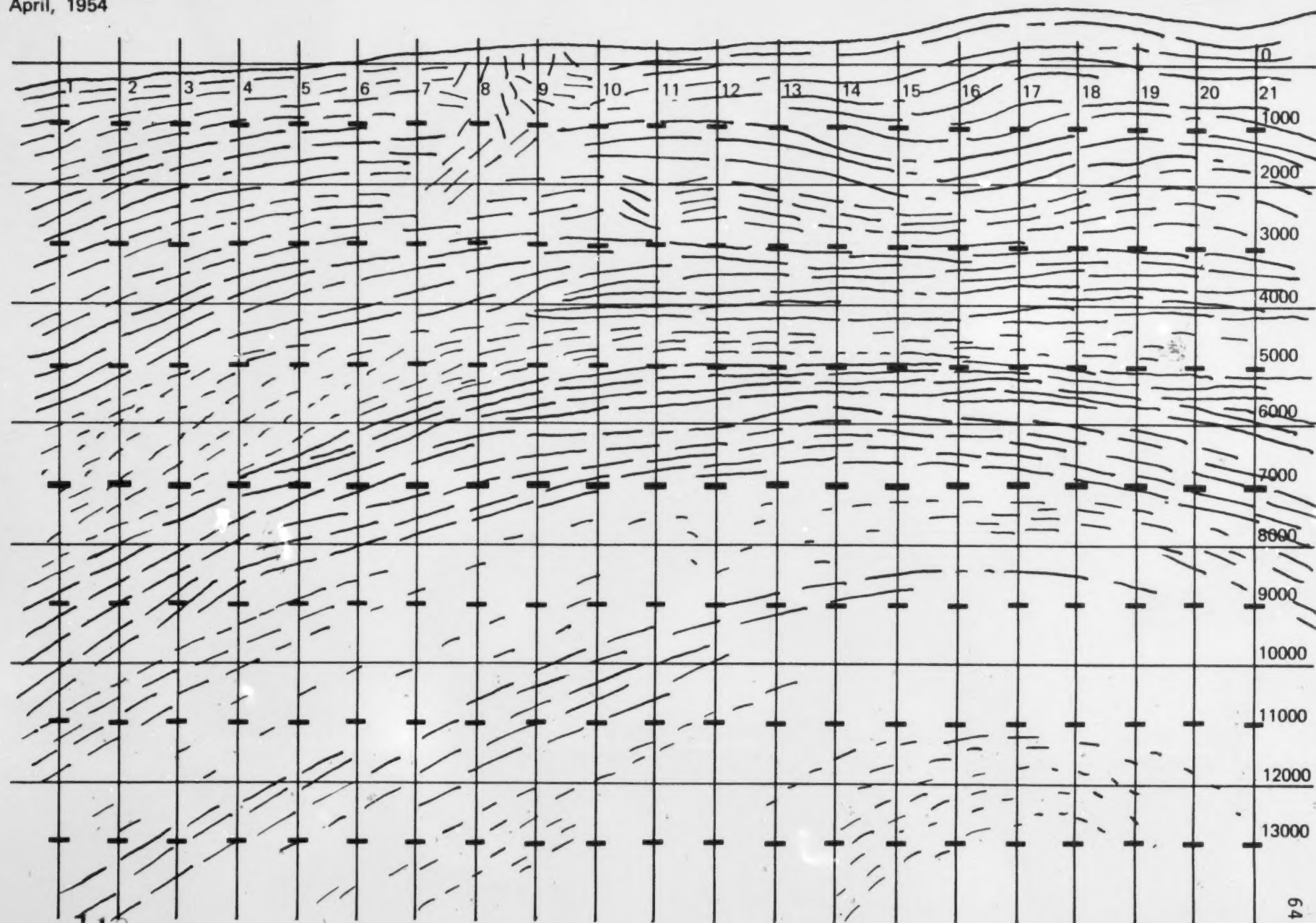
Cattle



ANACONDA PLATEAU SEISMIC SURVEY

Top layer: left half shale, right half basalt

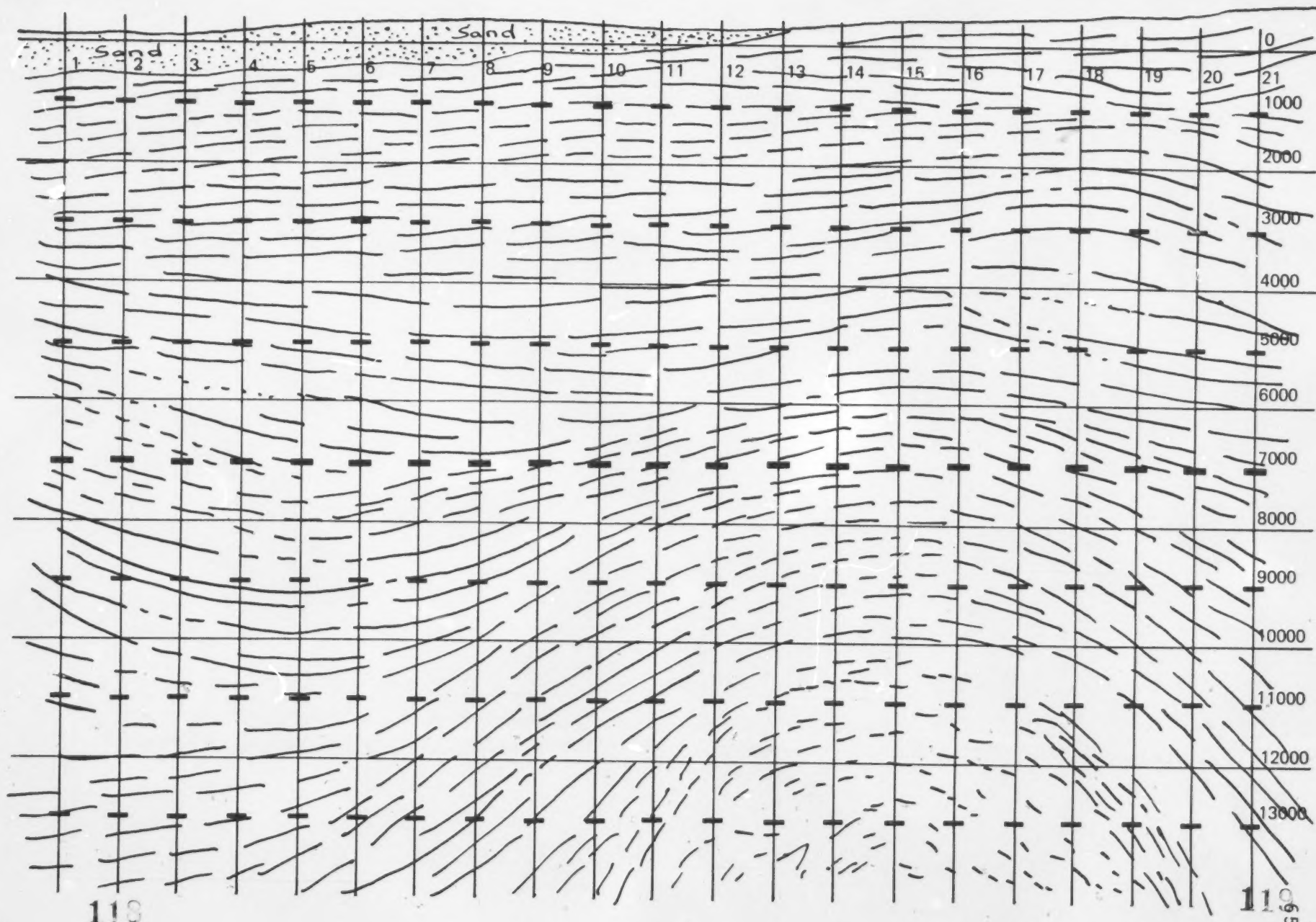
April, 1954



BENEDICT FLATS SEISMIC SURVEY

Top layer: beneath sand is limestone

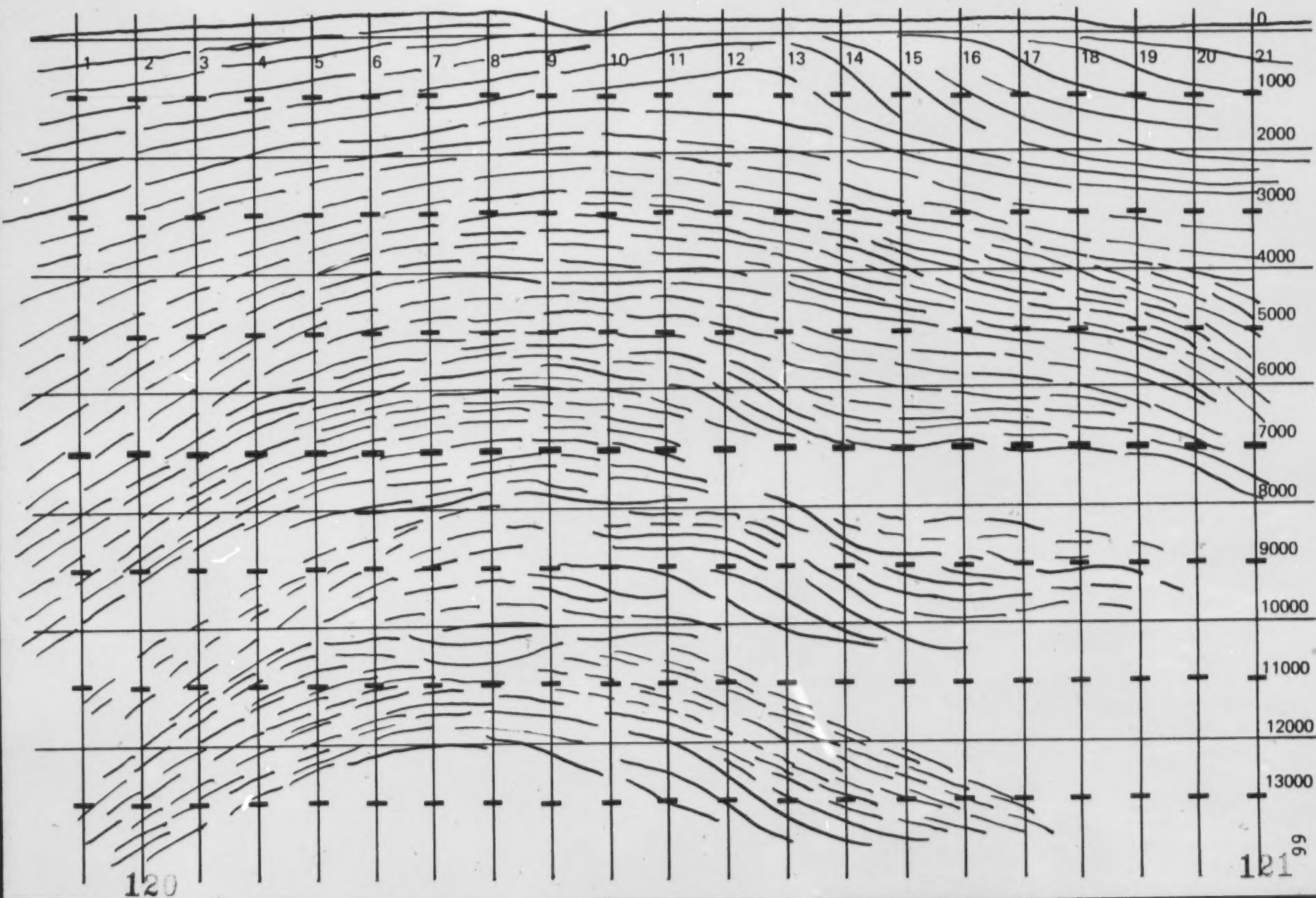
July, 1956



CALISTOGA VALLEY SEISMIC SURVEY

Top layer: limestone

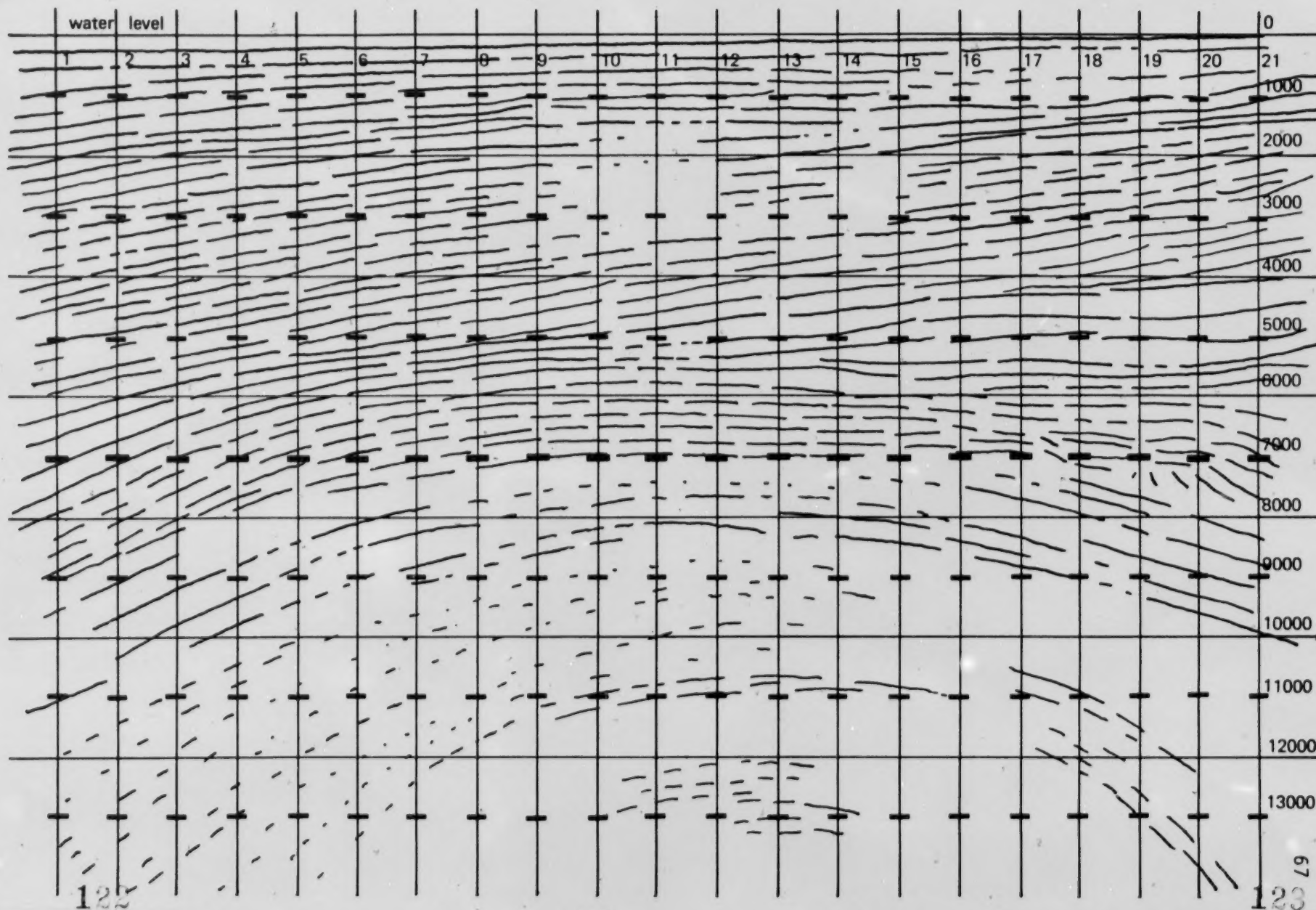
May, 1947



CARDIFF SEA SEISMIC SURVEY

Top layer: sandstone

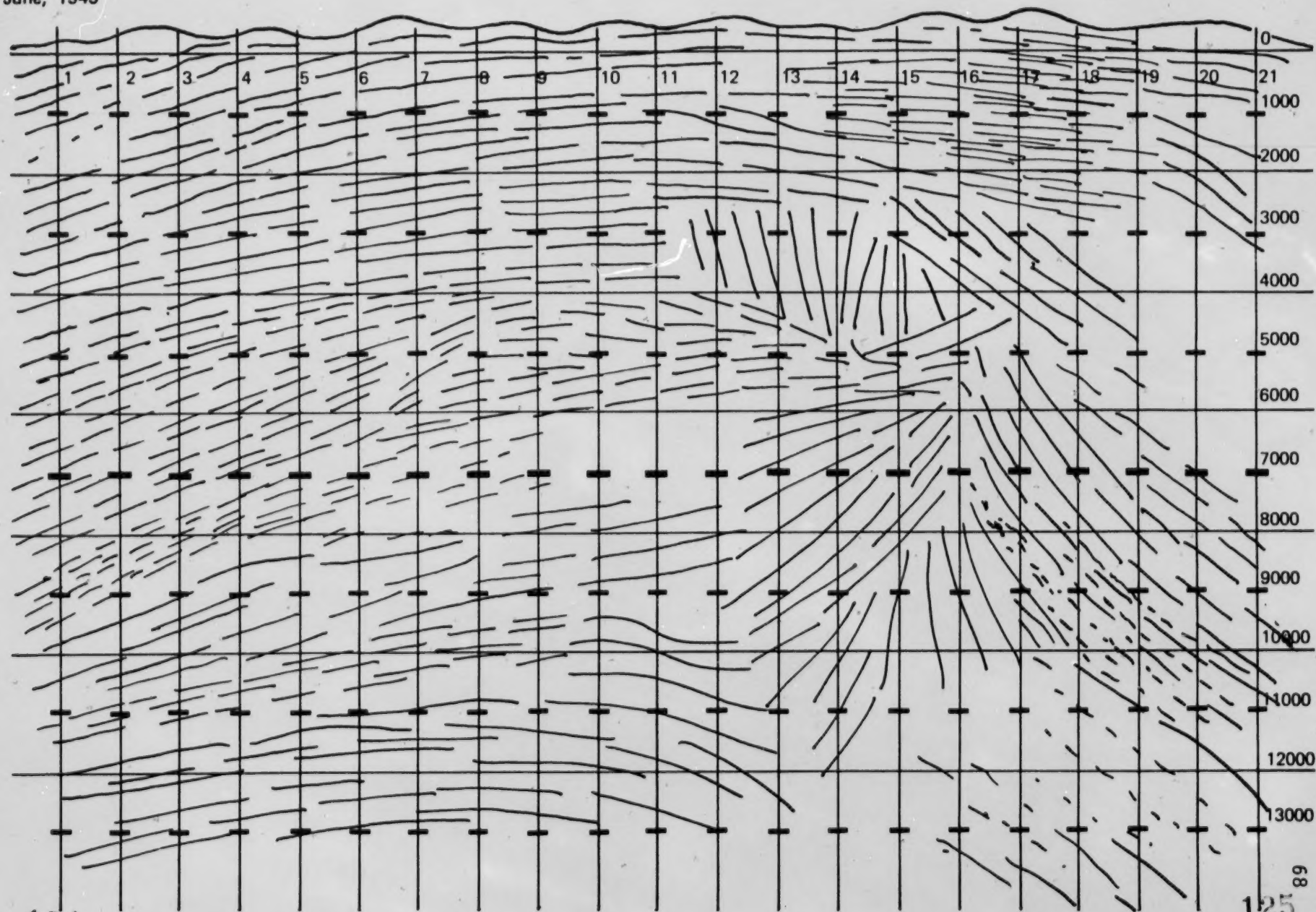
August, 1958



CENTRAL UPLIFT SEISMIC SURVEY

Top layer: limestone to no. 18, then sandstone

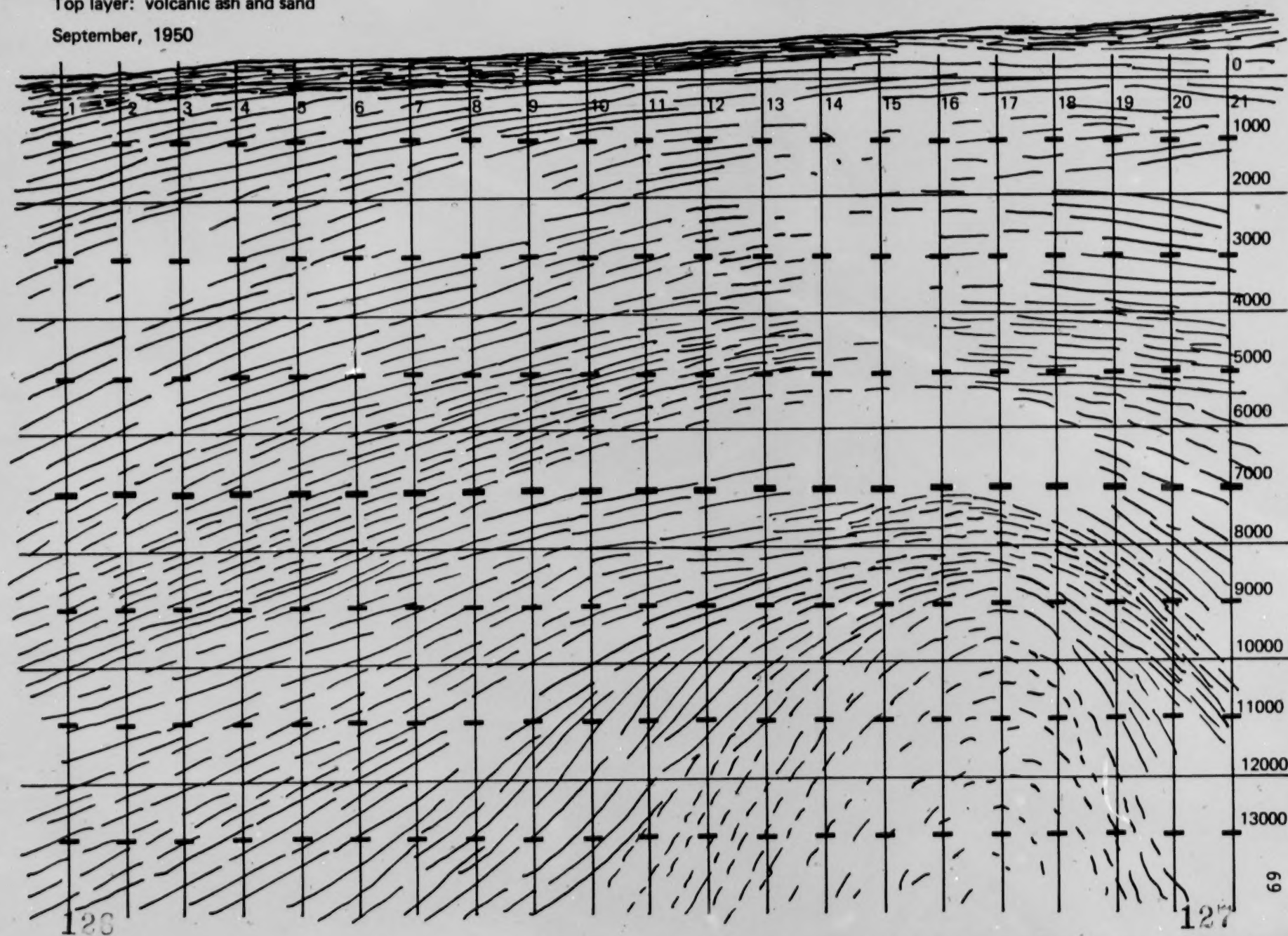
June, 1949



COLTVILLE INCLINE SEISMIC SURVEY

Top layer: volcanic ash and sand

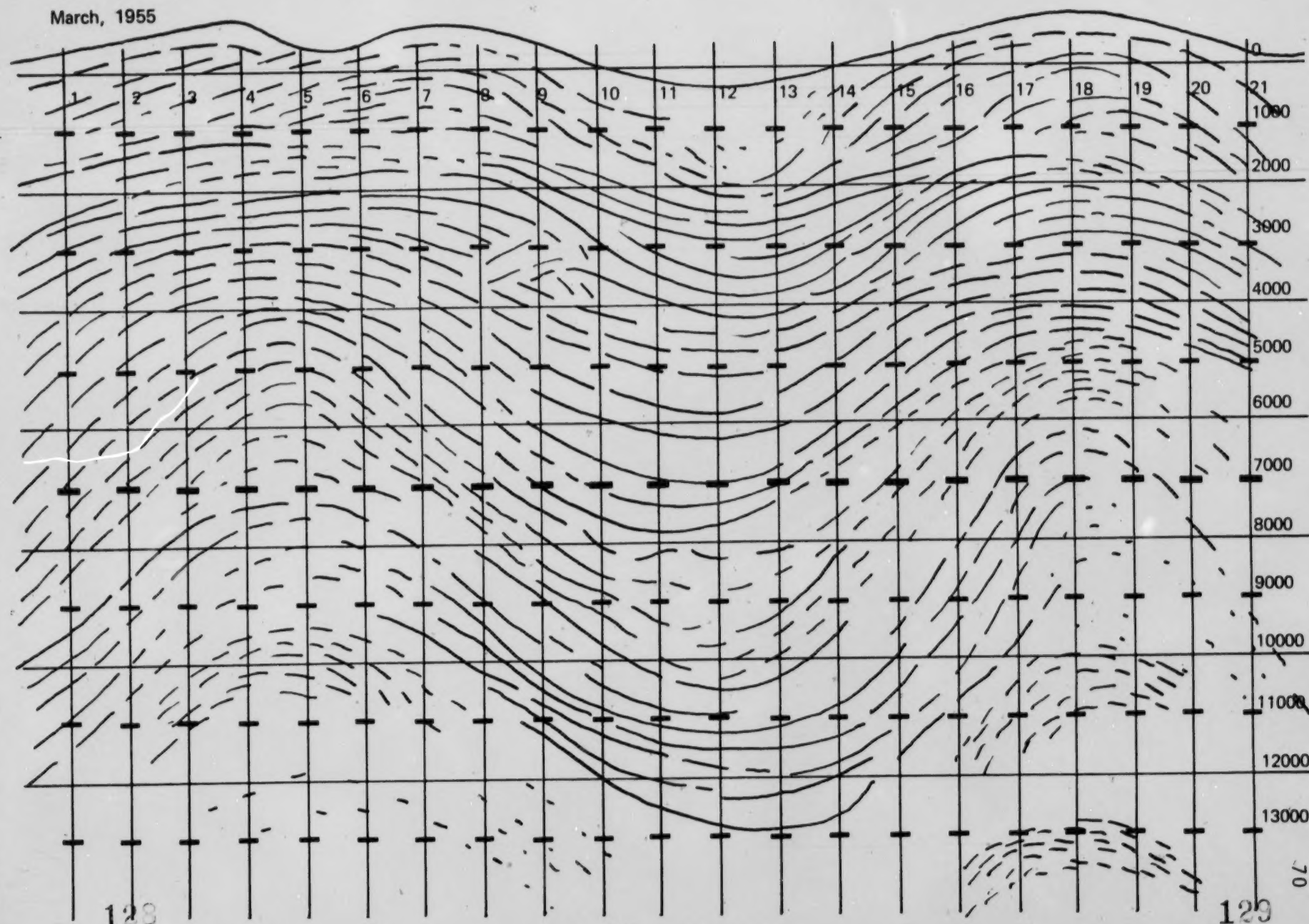
September, 1950



DOMAL MOUNTAINS SEISMIC SURVEY

Top layer: shale

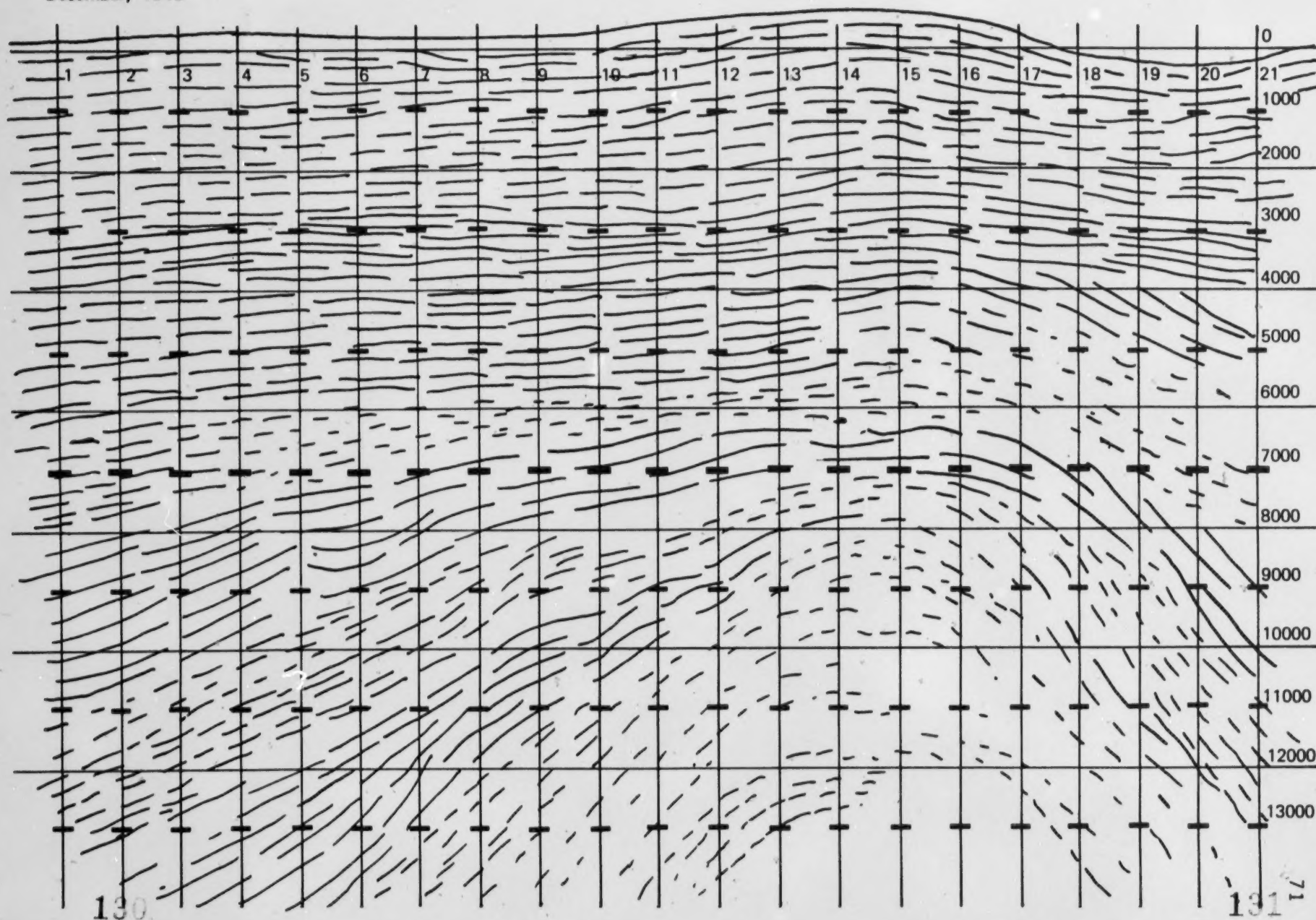
March, 1955



FREE WATER DOME SEISMIC SURVEY

Top layer: limestone

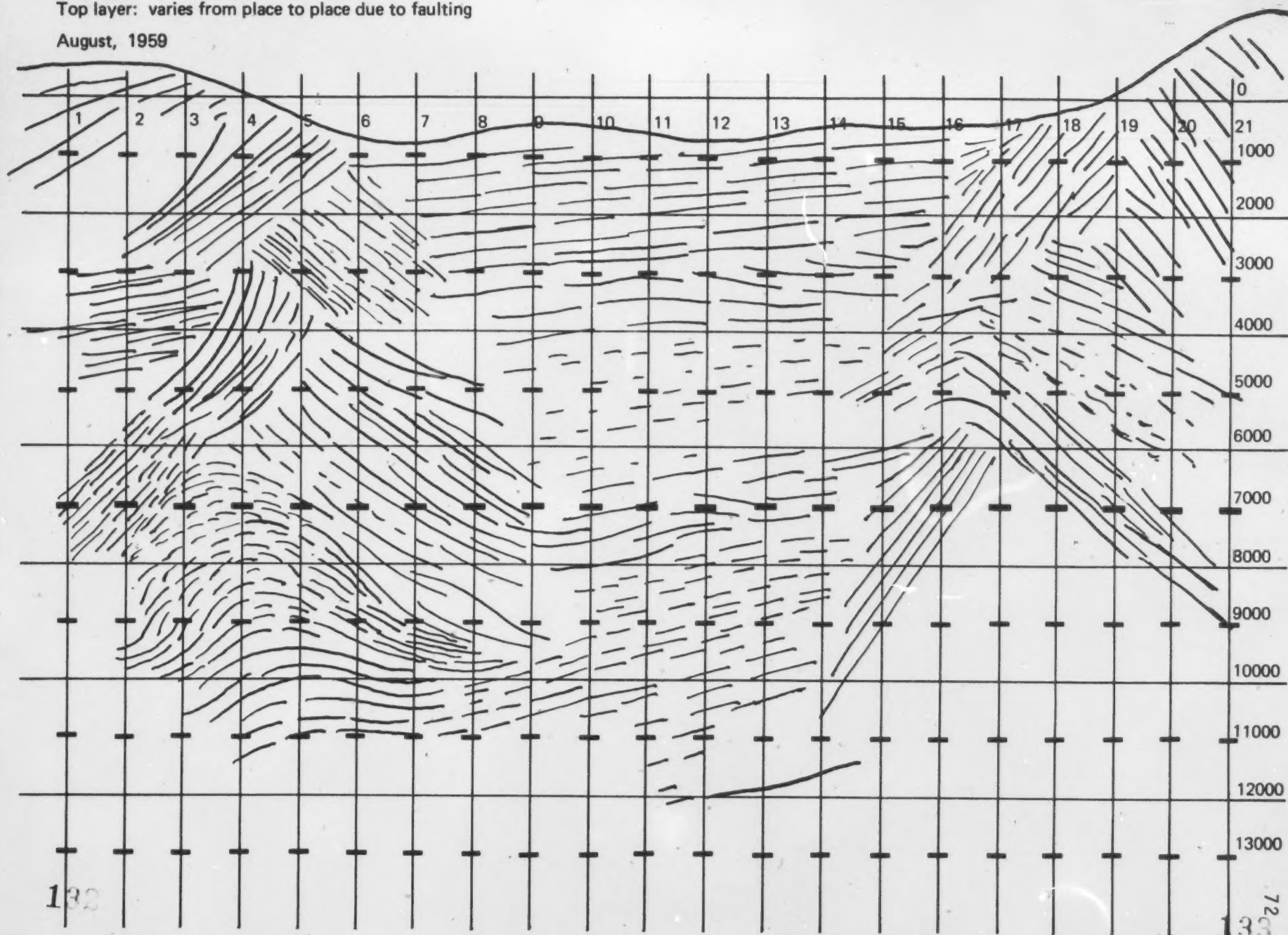
December, 1940



McCLEARY MOUNTAINS SEISMIC SURVEY

Top layer: varies from place to place due to faulting

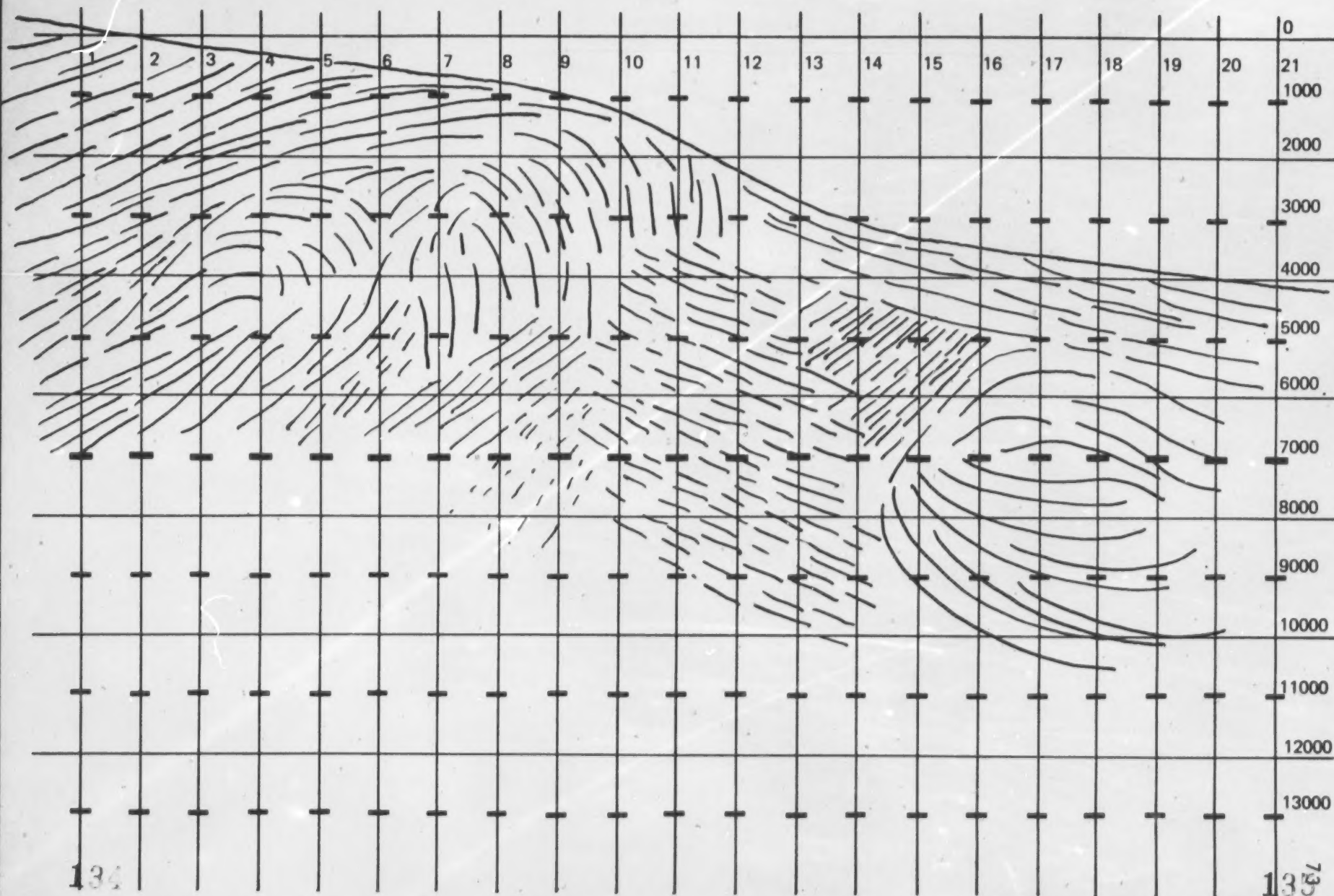
August, 1959



MERCEDES BEACH SEISMIC SURVEY

Top layer: sandstone to 800' depth, then shale

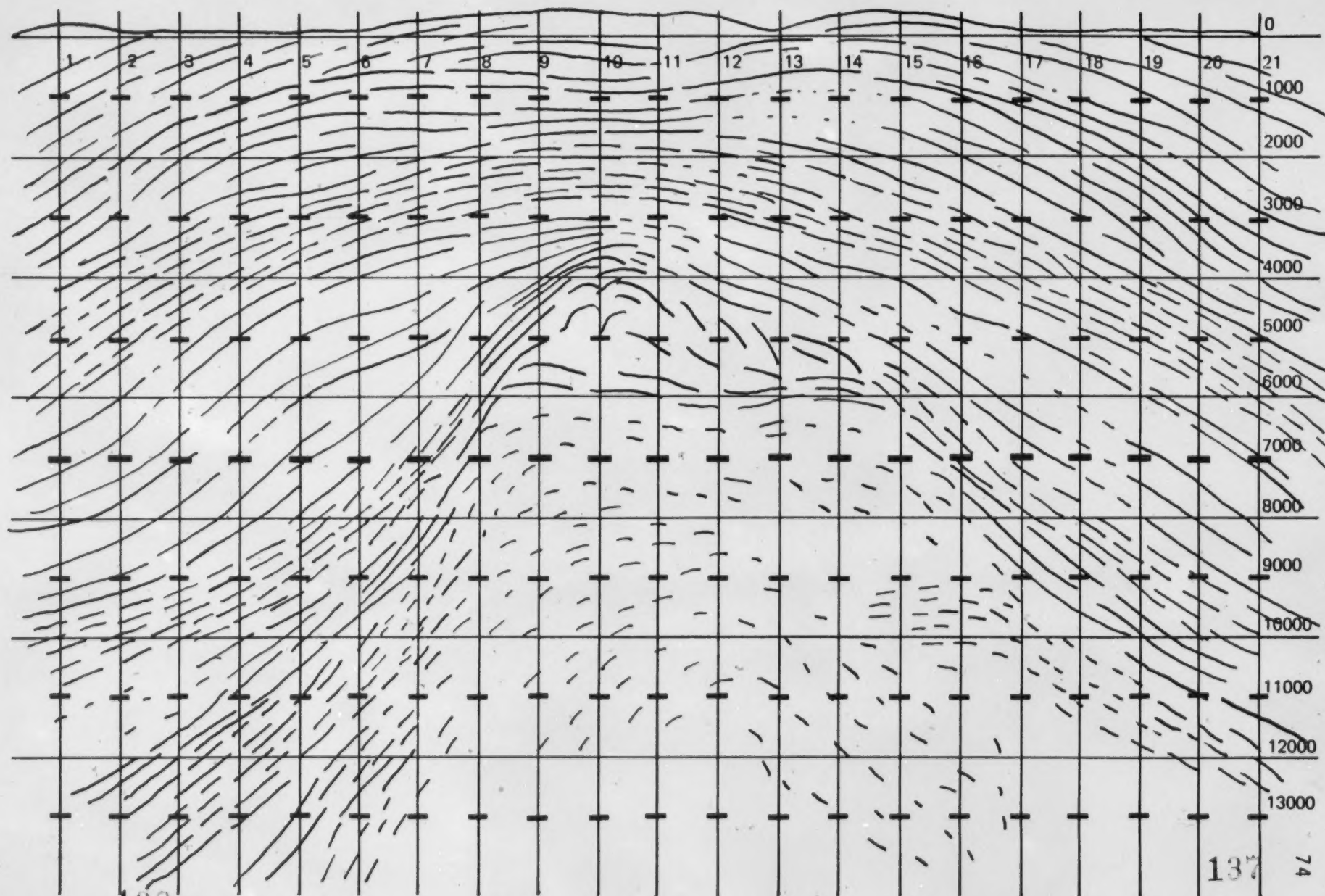
October, 1948



MORNING GLORY RISE SEISMIC SURVEY

Top layer: limestone

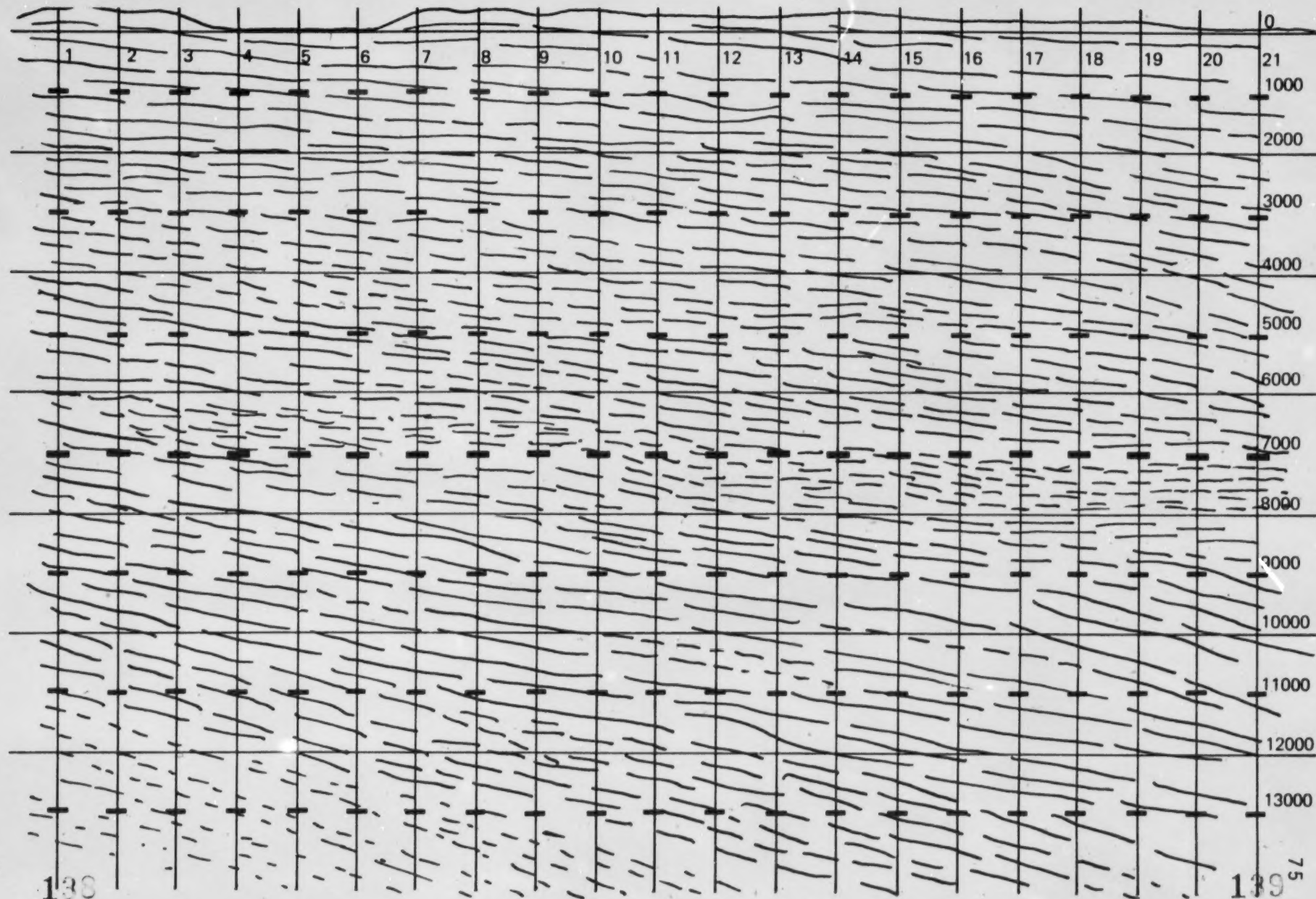
September, 1961



SMITHVILLE COUNTY SEISMIC SURVEY

Top layer: upper 2,000' is limestone

October, 1955



COSTS AND EARNINGS A GUIDE FOR DRILLING IN ALEXANDRIA

Question: How much will it cost for my company to drill a well?"

Explanation: Study the example given below very carefully!

Example: Central Uplift profile, any drill site.

FACTORS

NOTE VALUE

1. Seismic Survey

2

It costs money to make seismic surveys and the oil companies must bear this expense. What is more, some surveys will cost more than others because they probably were more expensive to make.

2. Lease

1

This amount is charged for using the land. Oil companies usually lease rather than buy the land in which they intend to drill. (The amount for a lease may increase if two or more companies want the same drill site. In such a case the site will go to the highest bidder, hence increasing the cost of the lease.)

3. Equipment Use

8

The drilling contractor charges for drilling the well with his rig. The farther you go out from Troy the higher this cost will be.

4. Development per 5000 feet

3

This is the cost for such things as operating fuel, drill pipe, casing, cementing, etc. (See Information Sheet #9.) The development fee is due at the start of every 5000 feet.

14

Total which must be paid before drilling begins on any one site.

5. Royalty

If you strike in the Central Uplift, you pay the owner (in this case the bank) one note value for every ten you receive for striking the oil or gas.

6. Tax

Here again, you pay the bank one note value for every ten you receive. You pay royalty and tax only if there is an oil or gas strike.

Following is a list of charges for each profile:

1. Anaconda Profile

Seismic Survey	2
Lease	1
Equipment Use	9
Development per 5,000 feet	4
Royalty	1 per 10
Tax	1 per 10

2. Benedict Flats

Seismic Survey	3
Lease	1
Equipment Use	5
Development per 5,000 feet	2
Royalty	2 per 10
Tax	2 per 10

3. Calistoga Profile

Seismic Survey	6
Lease	1
Equipment Use	5
Development per 5,000 feet	2
Royalty	2 per 10
Tax	2 per 10

4. Cardiff Sea

Seismic Survey	6
Lease	5
Equipment Use (offshore drilling platform)	25
Development per 5,000 feet	4
Royalty	1 per 10
Tax	1 per 10

5. Central Uplift		
Seismic Survey		2
Lease		1
Equipment Use		8
Development per 5,000 feet		3
Royalty	1 per	10
Tax	1 per	10
6. Coltsville Incline		
Seismic Survey		2
Lease		1
Equipment Use		6
Development per 5,000 feet		3
Royalty	1 per	10
Tax	2 per	10
7. Domal Mountains		
Seismic Survey		2
Lease		1
Equipment Use		10
Development per 5,000 feet		5
Royalty	1 per	10
Tax	1 per	10
8. Freewater Dome		
Seismic Survey		2
Lease		1
Equipment Use		5
Development per 5,000 feet		2
Royalty	2 per	10
Tax	2 per	10
9. McCleary Mountains		
Seismic Survey		2
Lease		1
Equipment Use		10
Development per 5,000 feet		5
Royalty	1 per	10
Tax	1 per	10
10. Mercedes Beach		
Seismic Survey		6
Lease		5
Equipment Use (offshore drilling platform)		25
Development per 5,000 feet		4
Royalty	1 per	10
Tax	1 per	10

11. Morning Glory Rise

Seismic Survey	
Lease	<u>2</u>
Equipment Use	5
Development per 5,000 feet	2
Royalty	2 per 10
Tax	2 per 10

12. Smithville Profile

Seismic Survey	3
Lease	1
Equipment Use	6
Development per 5,000 feet	3
Royalty	1 per 10
Tax	1 per 10

Question: Why is drilling offshore more expensive?

Explanation: That is a very good question and one which leads to a further explanation about offshore drilling. First, the main cost increase for offshore drilling is due to the higher cost of leasing and operating an offshore drilling platform. Such platforms are far more expensive to build and operate than the regular type drill rig. Secondly, an offshore lease is more expensive because the company can drill a total of seven wells from one site, hence, covering an area equal to seven drill sites. In other words, once a company has selected a specific site and has paid the equipment use and lease fees, they can drill the specific site plus three slant hole wells on each side of that site. For example, if a company chooses site number 10 in the Cardiff Sea, they (1) can drill site number 10 and (2) can slant hole drill from site number 10 to sites 7, 8, 9, 11, 12 and 13. That company's lease block includes sites 7-13, and they can slant hole drill to any level within those sites. Special materials are available for helping companies drill offshore sites.

Question: "How much will I earn if I strike oil or gas?"

Explanation: When a company strikes oil or gas, earnings will depend on the amount of petroleum in the pool or reservoir which has been struck. Every reservoir of gas or oil has been given a quantity measure of one, two, or three. One is small, two is medium and three is large.

Example: If a company strikes oil at 6,000 feet in the Central Uplift, the instructor may say, "Okay, you have struck an 'oil two' at 6,000 feet! This means you have struck a medium sized pool. In this case your company can collect money notes equal to a value of 20, since an "oil two" has a note value of twenty."

Following is a list showing the value amounts one can collect for each kind of strike:

Amount	Note Value
Gas one.....	10
Gas two.....	20
Gas Three.....	30
Oil one.....	10
Oil two.....	20
Oil three.....	30

Obviously, you will have reason to be happiest when the teacher says, "Oil three" or "Gas three".

An Added Note:

When a company strikes oil or gas in a particular profile (for example, #6, Calistoga, 5,000 feet), that company has first choice on a maximum of four other sites on the same profile. That company must identify the specific sites desired and pay lease fees. Then other companies may bid and purchase leases in the profile, although for no more than one at a time. For example, if Alex Oil struck oil as described above and is confident more oil is present the company may lease four more sites at the going rate

in the same profile. The other companies, sensing that Alex has a major find, may rush to the field (profile), but can bid on and purchase only one site each. If one of the newcomers soon drills and strikes, then that company too can claim four sites, provided that many are left. This limiting feature has been established so that all sites will not be tied up early in the simulation.

Question: "What is the depletion allowance?"

Explanation: Whenever a company strikes oil or gas at a particular site, an additional value of five notes will be awarded during the pay period. If the company continues drilling in the same profile sheet and strikes oil or gas a second time, a value of two notes will be awarded. Thereafter a value of two notes will be awarded every strike in the same field. For example, if a company drills six wells in the Anaconda Plateau and strikes oil each time, their total depletion allowance will be $5 + 2 + 2 + 2 + 2 + 2$ or 15 notes. This amount is not considered profit. It is an allowance given to account for the fact that every producing well will someday become dry or nonproductive. A company can use the allowance to help pay for the cost of drilling new wells. These new wells will replace the older, nonproductive wells.

ACTIVITY FOUR: CHOOSE ONE SITE AND GO TO THE BANK!

Note to the instructor:

This activity, like the previous two, is a necessary preparation segment for the drilling episode. In the last activity each company had the opportunity to select several possible drilling sites. Now each company must narrow to one site and arrange financing for drilling at that site. Most of this activity will be devoted to helping the students understand the accounting procedures.

Objectives:

1. Each oil company can go over the drill sites considered in the previous activity and select one site for actual drilling.
2. Each company can complete financial arrangements for drilling at its selected site.

Materials:

1. All materials previously listed in the second and third activities.
2. An "Accounting Sheet" for each company to use in keeping track of financial operations.
3. A set of money notes.
4. An overhead transparency of a completed accounting sheet for teachers to use in explaining the financial aspect of drilling.

Procedure:

- | TASK | RESPONSE |
|--|--|
| <ol style="list-style-type: none"> 1. The teacher begins this session by asking each company to choose one site where they intend to drill. | <p>The classroom will be noisy for a few minutes as students of each company gather together and select from previous choices the one site they believe will be their best starting point.</p> |

2. In preparation for actual drilling, each company borrows money notes needed for developing the starting site. The instructor explains that each company can borrow notes up to a value of thirty and the interest rate on a standard starting loan is one note for every ten borrowed. Hence, if a company borrows an amount equal to a value of thirty, then thirty-three eventually must be returned to the bank. If a company needs an additional loan after initial drilling, the original interest rate of one per ten remains the same. The interest rate rises to two per ten if a company has to borrow again following the second loan. When a company clears its debt and then must borrow again, the one per ten rate is in effect.

For those companies planning to "wildcat" or drill without aid of seismic information the interest rate on the initial loan is two per ten and three per ten on the third loan. The rate decreases to standard amounts if a company decides to utilize seismic information.

3. In this step each company pays the necessary amount for starting, and all students become familiar with the accounting system for keeping track of finances. The instructor introduces the "Accounting Sheet" and helps students record present transactions (securing a loan and paying initial drilling costs). Within each company one individual may assume responsibility for "keeping the books".

3. Following is the method an instructor may choose to use in explaining use of the "Accounting Sheet". (An overhead transparency is included to help in the process).

"It is important that each company keep track of all costs and earnings. Accurate accounting is necessary for determining the financial success of your operation.

"Note how this transparency is like the accounting sheet you have in your hands. It has eight titled columns. (Instructor reads the titles from left to right.)

"See how Alex Oil Company, a company of two students, recorded transactions over a two day period:

1. "Starting at the top, the company placed eight money notes of one value each in the 'Notes Received' column. Both individuals in the company started with four notes apiece, which they combined to make the total of eight notes. Recall that each of you started with four notes. Your company will need to post the total of all the notes with which the company started. For example, if there are three individuals in your company, place the numeral '12' (3 x 4) in the frame.
2. "On the same day (second line) note how Alex Oil almost went into debt! Using notes from personal savings, they purchased seven notes worth of seismic surveys. This action was recorded as such and the seven notes spent were marked in the 'Notes Disbursed' column, leaving them with a one note balance.
3. "On the next day (2-19-75), a thirty value bank loan was received and recorded. Any money notes you receive should immediately be recorded in the 'Notes Received' column. Alex also had to record "Debt", which is the bank loan plus interest. This figure (33) will enter into the picture again later when it is time to figure profit.

4. "The addition of the bank loan (30 notes) and money left after purchasing the surveys (1 note) equals the balance (31 notes) in the column labeled 'Notes on Hand'.
5. "On the same day, Alex Oil then had to pay for starting a well. In this case the amount paid was a value of fourteen notes (one note for lease, nine notes for equipment use and four notes for development per 5,000 feet equals the fourteen note total). Since it was money paid out or 'disbursed', the accountant again had to adjust the balance column ($31 - 14 = 17$).
6. "The next day (2-20-75) Alex started drilling and struck nothing in the first 5,000 feet. Hence, the company paid out eight more notes (four per 5,000 feet) so drilling could go to the bottom of the sheet. Note how the balance is adjusted after every transaction.
7. "Shortly Alex struck an 'oil two' at 10,500 feet. The company received notes equal to a value of twenty for the oil and a depletion allowance of five notes. The balance was promptly adjusted to 34 notes ($20 + 5 +$ previous balance of 9).
8. "Since oil was found, royalty and tax payments were due immediately and once again money notes were paid out or disbursed and the balance adjusted to 28 notes.
9. "Alex drilled to the bottom of the profile sheet and found no more oil or gas, so the next day the company moved to #8 site. Remember, whenever you move to another site, such things as lease and equipment use fees are due again. Note how Alex had to once again pay fourteen notes.
10. "Moving faster, see how later development costs, an oil strike, a second depletion allowance, royalty and tax were recorded as previously. (See #'s 7, 8, and 9 above.)
11. "Following activity at the end of the day, the teacher had another individual check or audit Alex Company's accounting sheet. No errors were found. If there had been any errors Alex would have paid a value of three notes for each error. So mistakes can be costly! Be careful!

12. "Has Alex made a profit yet? (No!) But this does not mean Alex will not earn a profit in the days ahead. In order to declare a profit, the company must have the notes in addition to the amount of notes with which they started from personal savings. For example if Alex started with eight notes from savings, repaid the original bank loan of thirty-three notes and still emerged with a total of seventeen notes, then Alex made a profit of nine notes ($17-8=9$).

TASK

4. Now each company can borrow the money notes needed for drilling at the site selected earlier. The bank will loan up to thirty notes per company. For ease in bookkeeping, the bank lends in sets of ten. In other words, a company can borrow ten, twenty or thirty one value notes, but not something like fifteen, nineteen, or say, twenty-seven one value notes. The remainder of the activity will be devoted to arranging financing and working up accounting sheets.

RESPONSE

The students should become very involved in borrowing money notes and in getting the accounting sheets in order.

Co. _____ ACCOUNTING SHEET

No. _____

[illegible]

Co. Alex Oil ACCOUNTING SHEETNo. One

Date	Action	Notes Received	Notes Disbursed	Notes On Hand (Balance)	Debt	Profit	Losses, Fines
2-18-75	From personal savings	8		8			
2-18-75	Purchase seismic surveys		-7	1			
2-19-75	Bank loan	30		31	(30+3)		
2-19-75	Costs for drilling at #2 hole, XYZ Hill		-14	17			
2-20-75	Added development costs for drilling past 5,000 feet		-8	9			
2-20-75	Oil strike (O 2) at 10,500 feet	20		29			
	Depletion allowance	5		34			
2-20-75	Royalty (1 per 10)		-2	32			
2-20-75	Tax (2 per 10)		-4	28			
2-21-75	Costs for drilling at #8 hole, XYZ Hill		-14	14			

Co. Alex Oil

ACCOUNTING SHEET

No. Two

[illegible]

ACTIVITY FIVE: BOOM OR BUST?

Note to the instructor:

In this phase of the structured experience, the students will become actively engaged in drilling for petroleum. Recall that the teacher has a set of sheets which contain information regarding the location and amount of petroleum for each profile. In using these sheets to monitor drilling progress, the writer stacked them, one on top of another, according to a semi-circle arrangement of the companies in the classroom. Movement from one company to another was accomplished in a clock-wise order around the semi-circle and the master profile sheets were rotated from top of the stack to bottom as soon as each of the companies drilled one thousand feet. In the procedure section below, further directions are given through a dialogue between the writer and two companies in the process of drilling.

Since the students always will want to know where the best fields are located, every company probably will attempt to log all wells being drilled at any one time. Every company of more than one member may assign an individual the responsibility of keeping track of competitors.

When a company strikes oil or gas, officials will need to collect the money notes and depletion allowance due them. The money will be paid out from the bank by the teacher or by a student appointed to act as a banker. This pay out can be accomplished when the company makes the strike or can occur later after several companies have struck and there is need for everyone to stop and update accounting sheets, pay back loans, select new sites, etc. If the latter plan of waiting is adopted, some credit system will need to be arranged so the company making the strike can continue drilling in the same profile or another one. Normally a company is anxious to collect earned money notes so they can pay off loans and/or start drilling in a new site. The teacher may devise his or her own way for handling the pay out periods.

No schedule or terms are given for the repaying of bank loans, although the teacher and students may decide on how loans should be repaid. In one pilot test companies settled with the bank when the drilling activity ended and it was time for them to figure profit (or loss).

Some of the companies making successive strikes repaid loans as soon as possible. This may seem like an informal and unrealistic way to handle the banking aspect; however, during the actual drilling everyone is so busy trying to find oil that they tend to overlook "payment due" dates. Also, the accounting procedure is complex enough without adding a loan repayment schedule.

It is difficult to say how long this activity should continue. Much is up to the teacher here; however, it may be wise not to stop until every company has had opportunity to drill several sites and perhaps experience the ups and downs of the oil business. Then they will be better prepared for the decision making aspect of Activity Six.

Objectives:

The students, working individually or in small groups, can develop one or more of the drill sites in the given profiles.

Materials:

1. Except for Reading # 1, all materials previously enumerated will be used. Again they will find use for the Information Sheet #'s 1-9.
2. Transparent slant hole drilling diagrams for teacher and student use.

Procedure:

Here is an example of two companies drilling. One company Alex Oil (AO), is drilling at Site #4 in the McCleary Mountains. The other Gulp Oil and Gas (GOG), is at Site #14 in the Colville Incline.

TEACHER
"Okay, Alex Oil, proceed!"

STUDENTS (Companies)
AO: "We drill to the 1,000 foot level."

"You started in sandstone and you're still in it at 1,000 feet."

"Take off, GOG."

GOG: "Drill 1,000 feet at #14"

"After passing through a surface layer of volcanic ash and sandstone, you went into a layer of sand. At 600 feet, your drill bit struck shale. You're still in it at 1,000 feet."

"Yes, that's right!"

"Okay, Alex."

"At 2,000 feet you're drill bit is resting on a fault line. The next layer you will enter is shale."

"Ready, GOG?"

"At 1,400 you passed from shale to limestone, which you're still in at the 2,000 foot level."

"Alex?"

"You're still drilling into shale layer."

"Back to GOG."

"That's right."

"At 3,000 feet you're pushing from limestone to shale."

"Over to Alex."

"At 3,600 you drilled from the shale into limestone."

GOG: "In the shale?"

A0: "Drill to 2,000 feet."

A0: "Great! We're right in a fault area. Let's take another look at that one diagram on faults."

A0: "Wait a second--we need to log that last piece of information. Okay 3,000 feet."

GOG: "You said Alex is still in shale at 3,000 feet?"

"Okay we're down to 3,000 feet."

A0: "4,000 feet."

"Back to GOG."

GOG: "We go down to 4,000."

"You're still in that layer of shale."

"Take-off, Alex."

A0: "Down to 5,000."

"You're still in the limestone. You need to pay development costs for drilling the second 5,000 feet."

"Okay, Gulp, ready?"

GOG: "Ready to go to 5,000 feet."

"At 4,800 you went from one layer of shale to another. Your development costs also are due if you want to continue in the same hole."

"We'll go ahead and pay what it takes to drill to the bottom of the sheet."

"Back to Alex."

A0: "We're down to 6,000."

"At 6,000 feet you are passing between limestone and shale."

"No fault?"

"No, Alex, and it's over to GOG."

GOG: "Down to 6,000"

"You're still in that second successive layer of shale."

"Alex?"

A0: "Okay, try for 7,000."

"No oil, but lots of shale."

"The same layer we were in?"

"Yes!"

GOG: "We'll take her down to 7,000."

"You're in a belt of sand, which you cut into at 6,300."

"Sand?"

"Keep rolling!"

A0: "We'll take 8,000."

"Still in the shale, A0.

"Back to GOG."

GOG: "8,000 feet."

"At 7,300 you left the sand and went into shale and now you're right on a limestone layer."

"Are we in a salt dome?"

"You'll have to drill further to see."

"How much further?"

"C'mon, now.

"Alex, where are you?"

A0: "Down, down to number nine."

"How do you like a second layer of shale? You received it about 8,200 feet."

"Thanks a lot! We're probably drilling in the one profile where there is no oil or gas!"

"Some people are born unlucky. Back over to you, Gulp."

GOG: "Take her to nine!"

"At 8,600 you traded the limestone for shale.

"Okay, Alex."

A0: "Drilling to 10,000 feet!"

"Okay, Alex, you have an 'oil three' right at 10,000!"

"Wow! We did it! Hooray! Do we get the rest of the day off?"

"Collect your thirty notes and a 5 note depletion allowance. Figure your royalty and tax, and by the way, some development costs are due if you intend to stay in this hole.

"Okay, Gulp, can you do the same thing?"

GOG: "Try for ten."

"Lets see--at 9,200 you hit sandstone and then at 9,800 you're in limestone again."

"Keep your chin up. Meanwhile back to A0."

A0: "Can we pass? We're still figuring our royalty and we have to decide where to go from here."

"Pass granted. Go ahead. Gulp Take her on down!"

GOG: "What's the use? Okay, down to 11,000 we go."

"You've passed through gypsum and into rock salt."

" "Welcome to the dry hole club. What's the market for rock salt?"

"Sorry!"

" "Can we do a right angle turn?"

"Sorry again! Would you like to try another site in this profile?"

"Let us think for a minute."

"Question, Alex?"

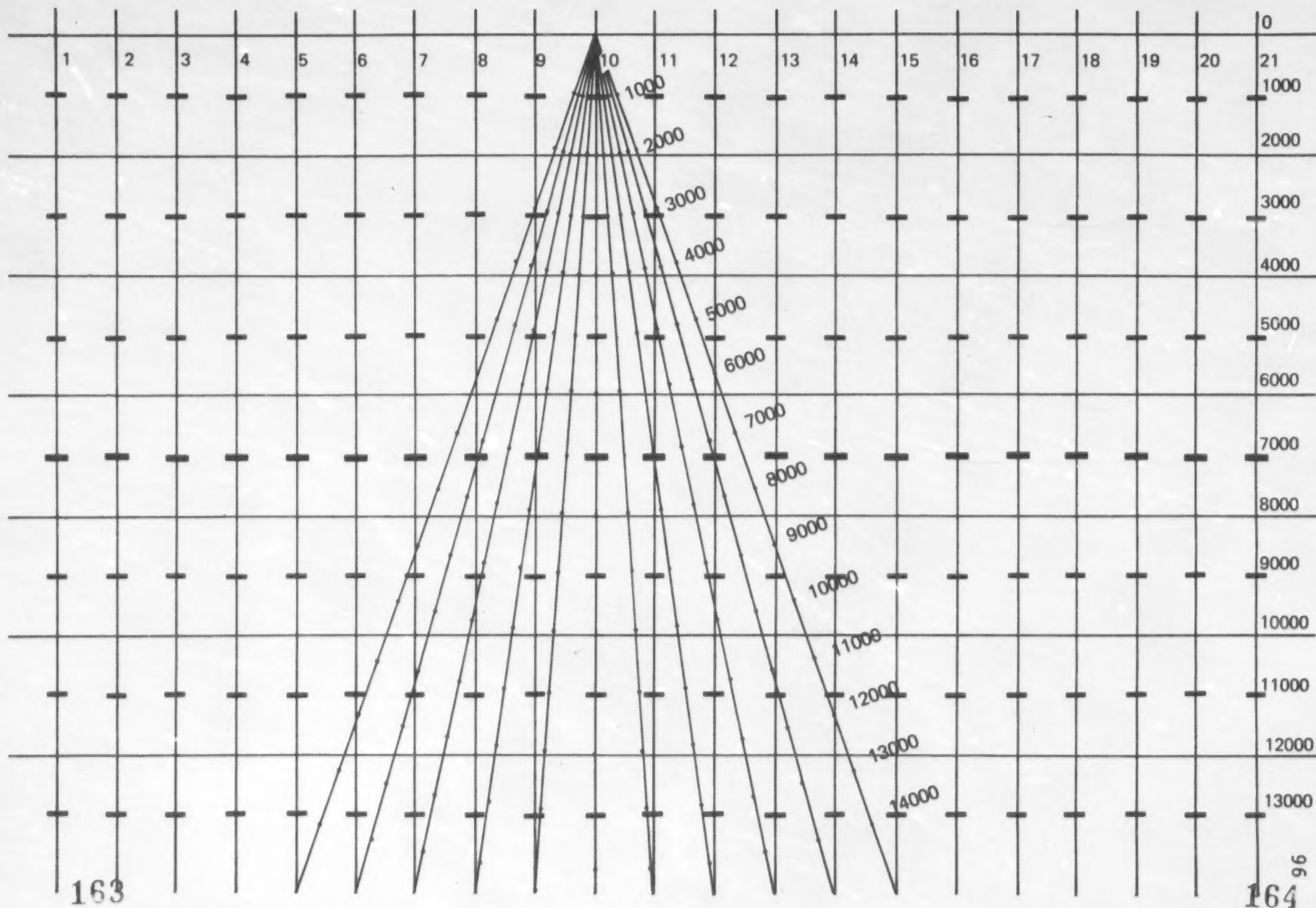
A0: "We're going to go ahead and buy up some leases."

"Which ones?"

"We'll take two, six and eight."

"That's where you'll start tomorrow. The bell is about to ring. Everyone take a few minutes and go over your accounting sheets."

SLANT HOLE DRILLING (Water Only)



ACTIVITY SIX: SHOULD WE DRILL IN MORNING GLORY RISE?

Note to the instructor:

Following class periods of drilling, the students must decide whether or not to drill in Morning Glory Rise. Earlier it was said that powerful groups had blocked development there for fear of pollution and destruction of the environment. These same groups also believed it wise to save some fields for a future time when all others have been depleted. Now the groups are under increasing attack from those who say it is necessary to drill now in such an accessible field. (Morning Glory Rise is very close to the city of Troy.) Exponents of drilling argue that the petroleum companies need to drill in order to make a profit so there will be capital for developing new sources of energy in addition to petroleum. The conservation groups have finally decided to remove blocking efforts and allow drilling, but only if all the companies agree to give up depletion allowances. They believe such monies should then be given to an independent agency for research into new energy sources (solar, nuclear, etc.).

Whether or not to drill should precipitate questions in the minds of students: "Should we go ahead and drill or should we save that field for the future? Should we take the chance of losing our depletion allowance by drilling in Morning Glory?"

For some the decision making might be easy: "Our company has had bad luck and we need to make a profit; therefore, we say drill! Who cares about a depletion allowance if you rarely get one!" A company that has it made because of several rich strikes may vehemently oppose such statements and offer this rebuttal: "We don't even know if oil is there! Why should we take a chance and lose our depletion allowance!" In light of such arguments, the class ultimately must vote "for" or "against" drilling in Morning Glory Rise.

Making the classroom decision as to whether or not drilling should occur will have three parts. First each individual must decide. Then each company meets, listens to the reasoning of individual members and makes a decision. Finally the entire class discusses the issue and decides. In the final class vote, the individual student does not

have to vote according to his company's choice, although most probably will back the company of which they are a member.

The main idea of this activity is to present a dilemma which stimulates students to focus on what may be the most important consideration when drilling for oil or gas. The situation is not too different from some faced by real oil companies. As in the case of real-life dilemmas the individual may feel conflict in terms of (1) the alternatives presented and (2) his or her emerging view and that held by the group. (i.e. "Can't we run a few test drills in Morning Glory before we decide on whether or not to give up the depletion allowance?" or "I know everyone in my company wants to go ahead and drill, but we should force people to conserve energy by not drilling in some fields!") Hopefully such conflict will cause students to listen carefully to ideas and insights presented by others on the matter.

This activity should lead into Activity Seven where the students again think about what is the most important consideration when drilling for oil or gas.

After deciding whether or not to drill in Morning Glory Rise, the students can go back to drilling for a day or so or can continue on to Activity Seven. (If they decide to drill in Morning Glory Rise, most will demand some more time for action "in the fields".)

Objective:

Given the dilemma situation of to drill or not to drill in Morning Glory Rise, each student can develop his or her own position on the matter.

Materials

Individual copies of Task Sheet #2

Procedure:

- | TASK | RESPONSE |
|---|---|
| 1. Each Student begins the activity by responding to Task Sheet #2. The | On the task sheet each student makes an individual decision as to whether |

instructor can read the sheet to them in order to liven interest. It may have to be emphasized that the first decision on the matter is an individual one.

2. After every student has committed self to a decision, each company will meet to discuss the issue and will make an official company decision. This period will allow students an opportunity to exchange views and to broaden perspectives on the matter.
3. Now the issue can be opened to class discussion and a final vote taken toward the end of the activity. The purpose of the discussion is to allow an elaboration and clarification of all points of view.

or not drilling should be undertaken in Morning Glory Rise. Most students will wish to confer with their company friends, but will have to refrain until the second phase of the activity.

The classroom should hum with activity as each company meets and individual members make known their views. There may exist differences of opinion in several groups, hence some argument will ensue. It is possible for a company to reach deadlock and no conclusive decision because of a tie vote of its members.

The discussion may be an interesting one if there is division among the companies. It may be a heated discussion if companies (or individuals) begin to oppose each other on the issue. Some pro and con ideas different from those given on the task sheet may be expressed, and argument can continue right down to the final vote. Some students may oppose their own companies in the voting. In other words, the final vote still can be an individual's choice.

TASK SHEET #2

Recall earlier that the right to drill in Morning Glory Rise was removed. Powerful acting groups blocked drilling because they believed it would cause pollution and destruction of a pleasant living environment. These same groups also said Morning Glory Rise should be set aside until a time when other oil and gas fields have gone dry. They argued that closing the field would encourage the people of Alexandria to conserve energy and that there will then be oil and gas for the future.

Recently a new group has said drilling should be allowed in Morning Glory Rise. Their Main argument is that drilling should take place so the oil companies can make more money. This extra money could be used to develop new energy sources for the future.

Those groups against drilling have now agreed to allow drilling in Morning Glory Rise if the oil companies immediately give up rights to any more depletion allowances. They say the depletion allowance money then can be used to develop new kinds of energy sources, such as solar energy, nuclear power and improved uses of coal.

What do you think? Should drilling be allowed in Morning Glory Rise? Are you willing to give up the depletion allowance? In the space below write your decision as to whether or not drilling should be allowed in Morning Glory Rise. Give reasons why drilling should or should not be allowed.

ACTIVITY SEVEN: WHAT WAS MOST IMPORTANT?

Note to the instructor:

In this activity the terminal objectives of the structured experience are developed. The students respond again in writing to the list of considerations they first saw in Activity One. Following this response, individuals can compare their post-drilling and pre-drilling point of views and try to determine why their views changed or even remained the same. The discussions and tasks which follow the initial phase of the activity are designed to extend their thinking to other issues regarding resource acquisition.

Objectives:

1. Each student can identify and explain in writing those factors which were uppermost in mind in making decisions during the activities of selecting and developing oil and gas well sites.
2. On completion of the individual writing, the students can discuss and decide as a group (1) which factors were most important in decision making and (2) how decisions may change in light of altered circumstances. (The altered circumstances will be given by the instructor.)
3. Following completion of the above two objectives, the students, individually or as a team of individuals, can respond in a creative form (panel discussion, simulated TV program, newspaper editorial, etc.) to at least one of the following clusters of tasks and questions:
 - a. If you considered your operation vital to national interests, express feelings on the matter of governmental aid. That is, should your firm have received money from the government to aid in searching and securing petroleum? Explain your answer.
 - b. If you believe money from the government should be given to oil firms, how much should be given and how should the government raise that money? Make a plan and let the class react to it.

- c. If your firm earned a profit, how do you intend to spend the money so that the company will survive and so that the nation always will have plenty of energy (and also will survive). Make a specific plan.
- d. If a national award is to be given to a petroleum company from Alexandria, on what basis should the award be given? As a member of the awards committee, explain the criteria which you believe should be used.

Since many teachers using this strategy are involved in study of Texas history, some additional activities are suggested at the end of the guide. The activities will involve students in study of the petroleum industry in Texas.

Materials:

1. Individual copies of Task Sheet #3
2. Individual copies of Task Sheet #4

Procedure:

TASK

1. Students begin this activity by completing Task Sheet #3, which is almost identical to Task Sheet #1 completed at the very beginning of the experience. This time each student indicates what was most important as he or she drilled for petroleum. The student then can compare pre and post drilling viewpoints.

RESPONSE

Many students will say profit and challenge were the most important factors. Profit was important because large amounts of money were required to find petroleum and to stay in business. At the same time, many became excited as they developed their abilities in finding petroleum.

Many students may discover that their viewpoints changed following Activity One. (i.e. "I started out in favor of 'providing people with cheap oil and gas'. At the end I chose 'the challenge of finding petroleum'.

I think the other is still important, but I really got carried away trying to find the best sites.)

Some may discover their views did not change; however, the drilling experience led to an additional perspective or insight. (i.e. "I still think protecting the environment is very important. I don't think we should have been allowed to drill more than five or six wells in any field. The real oil companies can't drill wells as close together as we are!")

2. Following individual completion of Task Sheet #3 the students discuss and decide as a group which factors were most important as they pursued the role of oil operators.

During the discussion the students will elaborate on their responses to the previous task. For example, some may feel uncomfortable in admitting that profit was a very important motive. Also, some for the first time may see why earning a profit is considered important by many people. As one youth said, "If no one had made a profit, we all would have gone out of business and there would have been no oil for Alexandria."

3. In a class discussion the students respond to the following "if" situations for Alexandria:

Which of the factors
(earning a profit, etc.)

The students may find that their hierarchy of considerations may change with circumstances.

Some may feel that conservation and maintaining the

would have been most important if (1) it was discovered that Alexandria had little oil or gas of its own and (2) foreign powers continued to raise prices?

national economy would have become most important.

What if everyone had gotten "carried away" with the idea of making huge profits?

Under such circumstances, protecting the environment would eventually emerge as very important. Many may come to realize that future citizens will pay a high price for everything if there is widespread neglect of the environment now. For example, a company interested only in making a huge profit may not attempt to meet minimum standards in cementing wells. The result could be salt water contamination of underground fresh water, which would have disastrous consequences for farming in the area.

4. Finally, number three objective above is developed. The students may remain in their oil company groups or the instructor may feel it necessary to form some new groups. Task Sheet #4 corresponds with this final phase.

Using creative expression to show the product of their thinking should add interest to this last act.

Extension: OIL AND GAS IN TEXAS

Students working individually or in small groups choose and accomplish one of the tasks or questions below. Final product should be available for all to view.

1. What is the state of petroleum resource production in Texas?
2. Make a report on the geography of oil and gas production in Texas. Include why some areas of Texas are non-producing.
3. Complete a file of news articles on petroleum development in Texas. After two weeks or so summarize the articles and give us your point of view on what is happening.
4. What events have led to the conservation of oil and gas resources in Texas? In order to deal with this question, read the history of petroleum production in Texas. Consult your social studies text first.
5. Locate and briefly tell about Texas boom towns related to the oil industry. Why have there been no boom towns in recent years?
6. What would Houston be like without the petroleum industry in Texas?

The Texas Almanac and recent social studies texts should make good starting resources for the above tasks and questions.

TASK SHEET #3

As you were drilling for oil and gas which one of the following seemed to be most important to you:

the challenge of finding petroleum?
conserving oil and gas?
earning a profit?
helping Alexandria's economy?
protecting the environment?
providing people with cheap oil and gas?
other? (Please explain.)

Place the numeral "1" next to the item you believe should be the main concern. In the space below, give reasons for your belief.

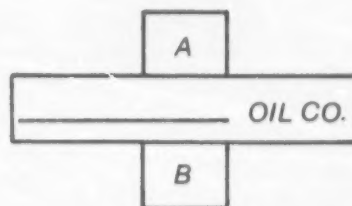
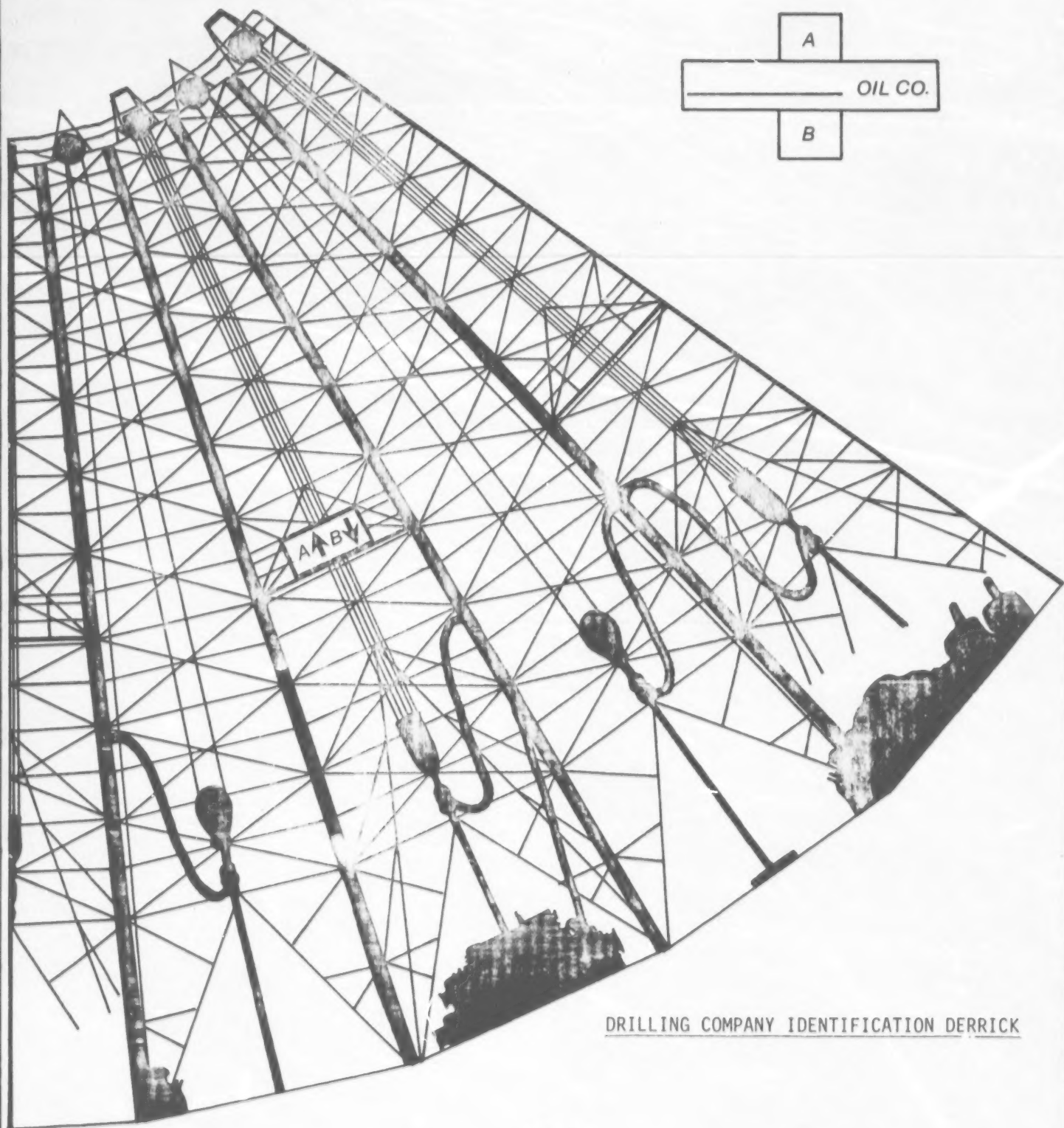
TASK SHEET #4

Complete one of the following (a,b,c, or d). Whether your task involves an explanation or a plan, make a creative presentation. That is, have a panel discussion, TV program, sidewalk interview, etc.

- a. If you felt your drilling operation was very important to Alexandria, do you think the government should have helped you pay some of your expenses? Explain your answer to the class.
- b. If you believe the government should have helped oil companies meet some of the drilling costs, how much should the government pay? How should the government raise this money? Make a plan and present it to the class.
- c. If your company earned a profit, how do you plan to spend the money so that your company will stay in business and so that Alexandria always will have plenty of energy. Make a plan and present it to the class.
- d. You are on a committee assigned the task of presenting a national award to a deserving oil and gas firm in Alexandria. What must an oil company do in order to receive such an award? Make a plan and present it to the class.

ASSEMBLY INSTRUCTIONS:

1. Write oil company name on tag.
2. Cut out the name tag and the derrick.
3. Carefully cut along the heavy, horizontal lines "A" and "B" on the derrick.
4. Fold the derrick along the four heavy lines and glue or paste to form a four-sided figure.
5. Fold back flaps "A" and "B" of the name tag and insert them into slots "A" and "B" of the derrick.



DRILLING COMPANY IDENTIFICATION DERRICK